RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.

PUBLISHED EVERY FRIDAY BY THE RAILROAD GAZETTE AT 83 FULTON STREET, NEW YORK

BRANCH OFFICES AT 1750 MONADNOCK, CHICAGO, AND QUEEN ANNE'S CHAMBERS, WESTMINSTER, LONDON

EDITORIAL ANNOUNCEMENTS

THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It consists of most of the reading pages and all of the advertisement pages of the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Transport and Railroad Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

VOL. XXXVIII. No. 11. FRIDAY, MARCH 17, 1905.

CONTENTS

EDITORIAL:
- Manganese Steel Rails 215
- The Costs of Yard Operation. 215
- The Work of the Bureau of Forestry.... 216
- The Ash Pit 216
- Use of Railroads in Russo-Japanese War. 217
- Electric Roads of the N. Y., N. H. & H... 217
- Mosquitoes in Massachusetts..... 217
- Termination of the Interborough Strike. 217
- New Publications 218
- Trade Catalogues 218

ILLUSTRATED:
- Reinforced Concrete Tunnel; Southern Ry. 218
- Improvements on Cleveland Div., B. & O. 220
- New Wheel Foundry of Penn. at Altoona 226
- Rebuilding the Oregon R. R. & Navigation 231
- The Denver Northwestern & Pacific..... 234
- Pennsylvania Freight Terminals in N. Y. 238
- Proposed High-Speed Double-Track Electric Line from Paterson to New York. 242
- Improvements on the N. Y., N. H. & H. 242
- Coal, Sand and Ash Handling Plants at McKees Rocks 246
- Standard Bridges on the Harriman Lines. 248
- Canadian Northern Railway in the West. 252
- Effect of Oil on Portland Cement Concrete 254
- Sheet Pile and Canvas Cofferdam for a Large Concrete Pier 258
- A Simple Easement Curve 260
- Manganese Steel Rails on Boston Elevated 261
- Railroad Gardening. 262
- Repairing a Bridge Pier Foundation on the Burlington. 263
- Reinforced Concrete Highway Trestle in Atlanta. 266
- A Two-Spindle Upright Moulding Machine 267
- The Red Cross Railroad Velocipede..... 267
- Coaling Barrow for Locomotives..... 268
- The Pratt & Whitney Turret Lathe with Equipment for Locomotive Work..... 269
- New Heavy-Duty Vulcan Shovel 270
- Sheffield Motor Cars 271
- A New Material for Smoke Jacks 271
- The American Water Softener..... 272

MISCELLANEOUS:
- The Cost of Locomotive Operation..... 224
- Standard Code Rules 263
- The Strike in New York City..... 266
- Judge Grosscup on Federal Regulation of Railroads. 267
- Supplying Electric Current for Interlocking Plants. 268
- Enforcement of Automatic Coupler Law. 269
- Report on Affairs of the Panama R.R. Co. 272

GENERAL NEWS SECTION:
- Notes 81
- Meetings and Announcements 82
- Personal 82
- Elections and Appointments..... 83
- Locomotive Building 83
- Car Building 84

Part One, of the current issue of the *Railroad Gazette* deals, for the most part, with a special and somewhat restricted field, in the effort which has been made to place before the American Railway Engineering and Maintenance of Way Association illustrated articles treating of the best and most characteristic examples of construction and maintenance work now in progress, east and west. Much attention has been paid to the drawings and photographs, which have been reproduced on a larger scale than has formerly been the rule, as, for example, the views along the line of the Oregon Railroad & Navigation Co. and of the Denver, Northwestern & Pacific, which are especially noteworthy. Part Two is devoted to a record in detail of each bit of construction work in the country. Much care has been taken to get this complete and accurate, involving correspondence with practically every railroad in the country, and corrections and additions have been made right up to the time of going to press. Important bridges are also listed, separately. The organization necessary for gathering this data increases in efficiency year by year, and the long list of brief, condensed statements which comprise the present report may be accepted as covering fully the entire range of new railroad building in the United States, Canada and Mexico.

The trials of manganese steel rails on the Boston Elevated, which are reported elsewhere in this issue, present a very remarkable case of rail wear on curves, not only in amount but in character. At the Park street station, where the tests were made, the degree of curvature and the traffic passing over the rails are probably greater than on any other steam or heavy electric railroad, and for this reason the results are not directly comparable with the usual observed data of rail wear on steam roads. There are a few curves in use on steam roads having a smaller radius than 82 ft., but they are in yards or industrial switches which are only used at infrequent intervals, whereas the Boston Elevated carries a traffic of 44,000 tons a day. In the New York subway the maximum curve is of 147 ft. radius and on the Manhattan Elevated, the sharpest curve is of 90 ft. radius, but no such remarkable wear has been observed there. The only feasible explanation for the amount of wear which takes place on the Boston Elevated is the fact that every car in the trains is a motor car, on account of the sharp curves and heavy grades, and that the wear of rails on the curves varies almost directly as the number of driving wheels passing around the curve. The flange wear seems to be no more rapid than might be expected, and the slow rate of speed at which the trains must round such a sharp curve excludes an assumption of excessive loading on the outer rail. In fact, the amount of wear on the outer rail would seem to indicate an excess of pressure on the inside rail and a consequent slipping of the wheels on the outer rail. Some time ago mention was made of the trouble experienced on this road with flat tires, and it may well be that the natural slipping of the outer wheel in addition to the slipping caused by the motors when working at full torque to overcome the curve resistance, causes the flat spots to grind the head of the rail much faster than if the wheel treads were perfectly smooth. The proportion of flange wear and top wear on the rails is unusual, particularly so in the case of the manganese rails. On curves of much larger radius on steam roads, the flange wear is much more pronounced, due to the longer rigid wheel base of the engines and the lack of side play in the couplings between cars. On the Elevated the rigid wheel base of the trucks is only about 6 ft., and the cars have radial drawbars, so that the flange pressure is much less than on an equivalent curve in steam road practice. However true this may be, it does not explain the lack of resistance to flange wear shown by the manganese rails, which are so superior to Bessemer steel rails in resisting top wear. This is an interesting metallurgical problem for which no solution has yet been advanced.

THE COSTS OF YARD OPERATION.

A calculation of the relative economies of different kinds of yards has to take into consideration so many things that a rigid comparison, as for example, between a hump yard and a tail switching yard, is almost impossible. The first difficulty encountered in such a comparison is the personal equation of the yardmaster, for a highly efficient man in charge of a yard operated by the tail-switching principle may be able to do his work even cheaper than a less efficient man who has a gravity or a hump yard. The fact that no two yards are ever called on to perform identical service in the way of classification, weighing, etc., also blocks the path leading to an exact comparison, for the additional classifications in a yard of the most modern kind may neutralize the wage saving of the gravity principle, if the calculation is made on the basis of the number of cars cleared. It is evident, therefore, that the total cost of handling a car from the time it enters until it leaves the yard will not serve as a measure of yard economy without additional data. The tabular matter which follows has been obtained from a study of five large yards, illustrating tail switching, operation by hump, by gravity, and by poling, with the number of classifications varying from twenty, in the smallest, to fifty-one in the largest, and with car capacities ranging from 2,700 to 10,000. It shows clearly the number of parts that go

to make up total cost, and the respective importance of each.

GENERAL STATEMENT.

Yard 1 is level, requiring tail switching, and occupies valuable land covering a large area, with many small pockets that necessitate rehandling. It also has several points of delivery to other railroads. The classifications of this yard are numerous—18 eastbound and 33 westbound, making a total of 51 classifications.

Yard 2 is of comparatively modern design, with a hump and also gravity for eastbound classification, and tail switching assisted by gravity for westbound classification. This yard also has large storage capacity on account of holding empties for distribution and also for holding cars for connections; 20 eastbound and 12 westbound classifications are required, making a total of 32.

Yard 3: At this yard, under the method of operation in use at the time of the preparation of this data, tail end switching is required partly assisted by gravity; 38 classifications are required, of which 21 are eastbound and 17 westbound.

Yard 4: This is a modern yard, with eastbound gravity humps and westbound tail end switching, requiring a total of 23 classifications, of which 15 are eastbound and 8 westbound.

Yard 5: This yard is operated, eastbound with a poling system and westbound with tail end switching. It has 20 classifications, of which 4 are eastbound and 16 are westbound.

TABLE No 1.—*Facilities.*

	Yard				
	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Acres area ...	175	106	70	41	62
Miles of track.	102	73	49	26	32
No. of switches	550	370	220	130	220
Car capacity ..	10,000	9,000	5,000	2,700	3,400

TABLE No. 2.—Volume of Business.

	Cars handled—			No. classifications.§		
Yard.	Through yard— Per day.	Per year.‡	Per yr. per car capacity.	East-b'nd.	West-b'nd.	Total.
No. 1	2,800	1,000,000*	102	18	33	51
No. 2	2,200	800,000	91	20	12	32
No. 3	3,400	1,250,000	250	21	17	38
No. 4	1,200	500,000†	153	15	8	23
No. 5	2,000	700,000	208	4	16	20

*Over. †Nearly.

§The number of classifications given does not include station order or separating air from no air.

‡A car is counted as one car for the entire movement through the yard from the time it enters to the time it leaves.

TABLE No. 3.—Force.

	Yard Nos.				
	1.	2.	3.	4.	5.
No. yard-engine tricks* ...	35	31	18	8	12
Men for operation of yard.	325	186	167	76	117

*12 hrs. each.

TABLE No. 5.—Cost per Car Passing through the Yard Divided for Various Charges.

	Yards				
	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Interest	.050	.024	.010	.017	.025
Maintenance	.088	.078	.033	.054	.041
Taxes & Insurance	.012	.006	.003	.004	.056
Operation	.454	.366	.166	.241	.228
Total	.604	.474	.212	.316	.300

TABLE No. 5.—Cost per Car Passing through the Yard Divided for Various Operations, Charges Pro-rated.

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Receiving	.045	.015	.014	.025	.027
Classifying	.351	.320	.092	.137	.147
Storage	.046	.060	.006	....	.004
Weighing	....	....	....	.022	....
Advance	.063	.023	.058	.090	.049
General	.099	.056	.042	.042	.073
Total	.604	.474	.212	.316	.300

Rates of Pay.

Enginemen. ..... $3.60 per day.
Firemen ..... $2.10 per day.
Conductors ..... 23 to 30 cts. per hour.
Brakemen ..... 19 to 26 cts. per hour.
Switch tenders ..... $47.50 to $50.00 per month.

As mentioned above, the complexity of the considerations involved renders it impossible that this information should be made to serve as an exact guide in determining the respective economies of different types of yards. The cost of classification per car moved, like the other elements involved in the account, is bound to be lowest when the movement is as large as the economic limits of the yard permit, so that the divisor is made as large as possible. Thus the yard (No. 3) which showed much the lowest cost per car, was operated by tail end switching, partly assisted by gravity, but had an annual movement of 250 times as many cars as the yard would hold at any one time, while the cost in yard No. 4, which moved in a year only 153 times the number of cars indicated by its stated capacity, was 33⅓ per cent. greater for each car cleared, although this yard was the most modern in design of any of those under consideration. Interest, maintenance, taxes and insurance, usually neglected in cost estimates, have also been included in the tables, and it is interesting to see that they work out, roughly, at about a quarter of the total cost.

Table No. 4, giving the total cost per car passing through the yard, divided for the separate operations, includes the proportion of interest, taxes, etc., which falls to each of those operations. The division in this case is purely a geographical one; that is to say, the interest on the capital expended for the receiving yard, together with its taxes, etc., is included in the total figure for each yard under the head of "Receiving." It is needless to say that this apportionment could not be made in a yard where the different functions were mixed in together, and not kept geographically separate. The table summarizes data which should be at the command of every general manager for the yards on his own road; not necessarily for comparative use, but as a measure of the actual cost of his yard operations. The rule-of-thumb figures commonly used neglect many elements which are component parts of the actual total, and the mistake is too frequently made of underestimating the cost of work.

THE WORK OF THE BUREAU OF FORESTRY.

When the importance of the industries connected with forest products is realized, it is remarkable that the technologist has, on the whole, devoted so little attention to the engineering problems connected therewith. It has been repeatedly shown that the value of the forest products of the country exceeds that of the products of the iron and steel industry. Of course, the chemical problems connected with the pulp industry and with the destructive distillation of wood in order to obtain by-products, have engaged the interest of chemists, but it is not too much to say that the operations of the preserving cylinder and of the dry-kiln, both of exceeding economical importance, are quite generally conducted under entirely empirical methods. A vast field of useful work thus lies open to the mechanical engineer who has been trained to a conception of the nature and content of wood structure. The people of the United States are being aroused to the importance of preserving the forests for the sake of the water supply and other public uses, and, in their turn, the purchasing agents and other officials of large companies are beginning to appreciate the need of study of those economies which will result from changes of the former methods of producing, preparing for use, and caring for when in use, the various forest products. The specifications such as those excluding "bled" forest products of one kind or another, contain clauses which militate against the acceptance of a great deal of valuable material, and so unnecessarily increase the price of the supply. These clauses are based on traditional opinions which have no basis of fact. One can recall in this connection specifications such as those excluding "bled" longleaf pine in cases where the strength of the material is the controlling factor or some part of the practice in steaming timber preparatory to the injection of preservatives.

The Bureau of Forestry, United States Department of Agriculture, has clearly in mind this side of its work, and is rapidly coming in touch, and in sympathy with, the lumbermen, the mill men, and also with the various classes of consumers. The work in seasoning and preserving wood, and the study of tree diseases, carried on by Doctor Hermann von Schrenck has been of enormous value, and not alone to the special interest of engineers and other consumers, since it has a direct bearing on the main problem of the Bureau of Forestry. The timber tests recently inaugurated by the Bureau of Forestry under the direction of Professor W. K. Hatt, of Purdue University, are entered into with equally definite ends in view. In Circular No. 32, entitled, "Progress Report on the Strength of Structural Timbers," abstracted in these columns, Dec. 30, 1904, tests are given of full-sized sticks, in which the defects peculiar to particular species of timber are allowed to operate. Information is given concerning the strength of the Pacific Coast structural timbers such as red fir and western hemlock, that are now reaching the East in increasing quantities. The endeavor is to test timber which has the probability of being on the market for an indefinite time. Thus the loblolly pine of the South will be fully investigated, being a species that may be depended upon to re-forest cut over lands in that region, and to form a means by which large lumber firms are enabled to reap periodic harvests of lumber in the practice of conservative forest management. It is easily seen that such timber tests are an essential part of the forest movement, and are intimately connected therewith. By showing the proper use of woods like loblolly pine these tests promote the practice of periodic harvesting, and so keep the forests in existence. While the results are highly useful in giving fundamental data for engineers concerning the strength of timbers, and thus in promoting public safety, the study enables the actual values of different species to be determined, and so prevents the waste or misuse of certain kinds of lumber. It may be noted that one-fortieth of the area of this country is under forest reserves, and that Uncle Sam is the largest holder of timber in the country. It would be an anomalous situation, under such circumstances, if the Government did not do its duty in studying the products that are being grown on these forest reserves, which are to be so administered as to be of use to the public. The attention of engineers of production should be turned to the field of forest products for excellent opportunities for the promotion of large economies.

THE ASH PIT.

"The quicker an engine can be made ready for business after coming into a terminal, the more money it will make for its owners and the less number of engines will be necessary to take care of traffic." This statement occurs in Mr. Robert Quayle's paper on locomotive terminals, read at the Master Me-

chanics' convention last June. A topical discussion subject reported for the 1903 convention, but not discussed for lack of time, related to the "slowest factor" at locomotive terminals. It is probably a safe assertion that at a majority of terminals this "slowest factor" is the ash-pit work, due to inadequate facilities. In many cases this is the result of the use of terminals which have been outgrown, but there are cases of new or improved terminals where the importance of this feature apparently has been overlooked, or at least not properly appreciated. Fire cleaning or dumping is one of the most frequently performed operations at a terminal, since many engines get no further than the table and do not enter the house at all, and the capacity of the terminal may be, and too frequently is, limited by the capacity of its ash-pit. There is therefore no wisdom in providing roundhouse facilities to handle expeditiously a large number of engines and then throttling the whole arrangement with an ash-pit that would hamper a terminal of half the capacity. Terminals of any importance with only one ash-pit track are sure to suffer serious and almost continual delays. Even though two or even three engines can be taken care of at one time—and it is a long pit, longer than is usually found, that will accommodate three engines—the single track makes it necessary for the engines to be taken in the order of their arrival, with freight and passenger engines lined up indiscriminately to await their turn. Preferred engines cannot therefore be favored in the slightest degree in their progress toward the turntable. If the pit is of the shovel-cleaned variety and not large enough to accommodate a day's accumulation of ashes, another restricting factor is present, as operations must be stopped at intervals to clean it out.

In the new coaling, sanding and ash-handling facilities of the Pittsburg & Lake Erie's McKees Rocks terminals, described on another page, avoidance of these difficulties appears to have been accomplished. The four-track ash-pit permits a flexibility of operation and a freedom of movement of locomotives that probably could be appreciated by no one so much as the officer who has the one-track pit conditions to contend with. The pit is as close to the roundhouses as yard conditions will permit, so that the engines have the least possible distance to run after their fires have been dumped. A good many members of the motive power department object to mechanical devices at the ash-pit, admitting their advantage and desirability when in good working order, but contending that their liability to get out of order, particularly when most needed, more than offsets their advantages; therefore we find many prominent advocates of the shovel-cleaned depressed-track pits. However, the Pittsburg & Lake Erie arrangement presents some new features which are entitled to consideration. The use of electricity will, it is thought, obviate difficulties that have been experienced with other sorts of mechanical equipments.

A feature of the coaling station which is worthy of note is the coal storage track. This track has a capacity for ten 50-ton cars and is given a grade toward the station to enable cars to be moved by gravity to the track hopper and thence to the "empty" storage track. It is necessary, therefore, to call on the switch engine only when a new lot of ten cars is needed. The latter can be run in and the empties removed at one operation, thus minimizing the possibility of delay on that account. The provision of two coaling and two sanding tracks permits as great freedom for these operations as the four parallel tracks do for the ash pit.

Railroads have played an important part in the war between Russia and Japan. Both armies have been to a large extent dependent on a single-track railroad for their commissary, quartermasters' and ordnance supplies in addition to bringing to the front the tremendous forces of reserves and fresh troops which have been engaged in the recent great battle of Mukden. Many conflicting reports have been given out about the carrying capacity of the Trans-Siberian, on which the Russian army has relied since long before the beginning of the war, and which was the key to the Russian occupation of Eastern Siberia and Manchuria. Its operation as a military railroad has undoubtedly been a great achievement if the condition of the roadbed and equipment before the war and the winter weather of Siberia are taken into consideration notwithstanding the fact that it has been woefully inadequate to meet the needs of the emergency. But as in every other detail of the conduct of the war, the Japanese operation of the railroads seized in Manchuria and the military railroad and tramway built in Korea up to the Yalu river at the opening of hostilities, has overshadowed the Russian effort in Siberia. To take a poorly built railroad, captured from the enemy after having been destroyed as far as possible before the retreat, to change the gage from wide gage to narrow gage and bring over locomotives and cars from Japan, to immediately put the line in shape to carry the supplies and reinforcements for an army of 200,000 investing Port Arthur and another army of 300,000 or 400,000 men 300 miles to the north, is in itself a wonderful feat of military and railroad engineering. But to do this in a few months in the middle of a winter as severe as any to be encountered in this country makes the achievement seem little short of impossible. The fall of Port Arthur was due largely to the awful bombardment of the 11-in. coast defence guns brought up from Dalny on the railroad. Twenty-five of these guns, the barrels of which alone weighed 10 tons, were placed in the besiegers' forts under fire and within three weeks from the capitulation, the enemy in front of Mukden 350 miles away was being hammered by the shells from these same guns brought up on the railroad along with Nogi's army of 100,000 men. The Japanese have been sending their young men to this country to learn how to run a railroad. American railroad managers and engineers might send some of their young men to the Far East and learn some things about railroads that they never thought of.

With the purchase of the Hartford Street Railway system by the New York, New Haven & Hartford, that corporation moves far to the front of the steam railroad corporations which have made investments in electrical roads. In Connecticut alone a computation, necessarily somewhat rough, shows that the New Haven Company now owns or controls about 400 electric single-track miles or about 57 per cent. of the single track mileage of all the street railways in the state. This represents actual investment of about $24,057,000, reckoning in underlying bonds and floating debt. If investments in Massachusetts and cost of the electrifying of former steam lines are included the electric single-track mileage of the company rises to something like 572 miles, and the investment to probably several millions above the figures stated; and this does not include plans and investments in the Bronx. In reaching out for new electric fields to conquer President Mellen appears now to have left for him only the large Connecticut Railway & Lighting system in Connecticut, the Springfield system in Massachusetts, and the Rhode Island system—all of them probably, and two of them certainly in the market and awaiting an agreement as to price. That dramatic railroad administrator seems, indeed, to have already nearly accomplished his main objective which, in the language of strategy, has been an organized navy on the Sound, a railroad army on the main land and outposts and interior forts in the electric railways. Probably his radical electric ventures have not been checked by returns which show that they are not merely taking care of the investment but returning at least one per centum annual profit to the proprietary company. Whether this will be the case when industrial depression strikes in, is under the time lock of the future. But, in any event, when the epoch dawns for interchanged street railway traffic with electrified steam roads the New Haven Company will be in a peculiarly advantageous position to be a pioneer in the experiment.

The mosquito is a carrier, common or uncommon, for the doctors have proved that he carries yellow fever germs from one person to another, delivering the goods to the recipient at his store-door, so to speak—and no charge for drayage. But to say that the insect is a conductor would be doing violence to the truth, for the contrary has been proved by the mosquito himself. This interesting scientific fact was brought out at the New England Railroad Club last month, where, in the discussion of Mr. Fitzgerald's paper on signals it was stated by Mr. W. C. Wetherbee, of the Boston & Albany, that some trains on that road had once been stopped by an automatic signal which was held in the stop position by the presence of the carcass of a mosquito between the points of the track relay. The precise chemical composition of the mosquito's body has never been determined, we believe; but it is evident from this incident that it is sadly deficient in carbon. Fortunately this method of suicide is rarely attempted by the insect tribe—mosquitoes are, no doubt, so cheerful and happy that they do not kill themselves at all—and therefore another hold-up from this cause is very unlikely. Mr. Wetherbee had another story, funnier than this. An enclosed disk signal was held in the stop position by an English sparrow which roosted on the counterweight. The question how the signal-case came to have a hole big enough to admit the bird is not explained; but that doesn't spoil the story. As there was no disturbance in the day time, when the sparrow was out on the warpath, the inspector had to make a number of night journeys before he discovered its cause. For a picture of this sparrow, in a natural pose, with all elements of mystery carefully cleared up, the reader is referred to some future number of one of the popular scientific papers.

The New York Interborough strike, referred to last week as causing such an unparalleled congestion of city traffic, is now at an end, practically speaking. The two leaders, Jencks and Pepper, are still striking, but the rest of the employees have been besieging the company's office to get their old jobs back again. The strike received no support from the public or from the reputable

press, and the finishing touch was applied by Warren S. Stone, Chief of the Brotherhood of Locomotive Engineers, when he not only refused the support of the national organization, but revoked the charter of the New York local, on the ground that Jencks had exceeded his authority, and that the motormen had flagrantly violated the clause of their agreement with the management in which they covenanted not to strike for three years, in consideration of the high wages paid them. In taking this firm position to show that the Brotherhood of Locomotive Engineers recognized the binding force of a contract, Mr. Stone has placed his order on a high level, far above trade unionism in general, which has so often repudiated its agreements that they no longer carry weight. Let all praise be given to the brotherhood that puts honor above expediency!

NEW PUBLICATIONS.

Railway Right-of-Way Surveying. By Albert I. Frye, Assistant Engineer, Central Railroad of New Jersey. New York: Engineering News Publishing Co. Cloth, 50 pages. Price $1.

The method of surveying, mapping and recording data which is outlined in this book is intended, as its title indicates, to be applied particularly to the permanent survey of railroad property, although many of the suggestions as to the making of maps, office bookkeeping of records and field practice can be applied to other lines of work. The system is based on the principle of reducing field measurements and all data to rectangular co-ordinates referred to a center line previously established, preferably by adjustment of all new and old data relating to early land and location surveys. The method of recording field measurements and data in permanent form in a ledger and journal has much to recommend it with the one disadvantage, perhaps, that the average office force would probably have to be increased in intelligence and numbers to keep the records accurately and completely.

Erie Railroad Employees' Magazine. 21 Cortlandt street, New York City.

The first number of this magazine has just been issued. It is to devote itself to the interests of the employees of the Erie Railroad, and promises to confine itself strictly to that field, being a fraternal magazine with no purpose of trespassing on the fields of the publications of the different brotherhoods. The circulation promised is 35,000, and no subscription price is mentioned; from which it would appear that the money to run the establishment is expected to come chiefly from advertisers. The editor is Edward Hungerford.

TRADE CATALOGUES.

Interchange Rules.—The McConway & Torley Company, Pittsburg, Pa., has just issued a supplement to the Car Interchange Manual, containing abstracts of the decisions of the M. C. B. Arbitration Committee, cases 668 of May, 1904, to 682 of December, 1904, inclusive. This pamphlet is prepared with a gummed insertion, so that it may be pasted in the back of the 1904 Manual. The above company also has copies of the complete Manual for 1905. These, as well as the above supplements, will be sent free of charge to clerks or car men who may find it useful in their work.

Railroad Frogs, Switches, Crossings, Etc.—The Manufacturing Company, Carlisle, Pa., sends its 1905 catalogue. It consists of 40 pages 8 in. x 10 in., which contain illustrations showing frogs, switches, crossings, rail braces, switch stands, portable mine tracks, etc.

Paints for Metal.—The National Paint Works sends a pamphlet bearing the title, "A Review of Technical Paints for Metal." It contains some interesting descussion in regard to the best paint to use, and illustrations are given of a number of prominent structures which have been painted with the company's paints. About 2 pages are devoted to a discussion regard to "What is the Best Prevention of Rust on Steel Cars."

The Chicago Railway and Commercial Institute has issued a 32-page pamphlet filled with fac-simile letters of appreciation received from graduates and officers of various corporations. The latter include many prominent railroads as well as other well-known concerns.

Thermit.—The Goldschmidt Thermit Co., New York, is distributing a pamphlet which describes the method of repairing roll bosses by means of thermit. The pamphlet is of especial interest to those connected with rolling mills.

Reinforced Concrete Tunnel on the Southern.

The construction of a reinforced concrete tunnel at South Knoxville, Tenn., on the South Knoxville spur of the Southern Railway, presents some features of interest. The tunnel, which is 368 ft. 6 in. long, is located in a gap of a small spur ridge that slopes northward toward the Tennessee river. The alinement includes 141.6 ft. of tangent and 226.9 ft. of an 8-deg. curve, and the grade is on a vertical curve which has its summit in the tunnel and slopes both ways on grades of about 2.2 per cent.

Section of Reinforced Concrete Tunnel at Knoxville, Showing Centering.

When the South Knoxville spur, which is a line to the various South Knoxville industries, was located during 1903, the idea of adopting a wooden tunnel was first considered, but was soon abandoned and in its stead the reinforced concrete design was adopted, and built during the latter part of 1903 and the early part of 1904. The location profile showed a maximum cut of 30 ft. where the

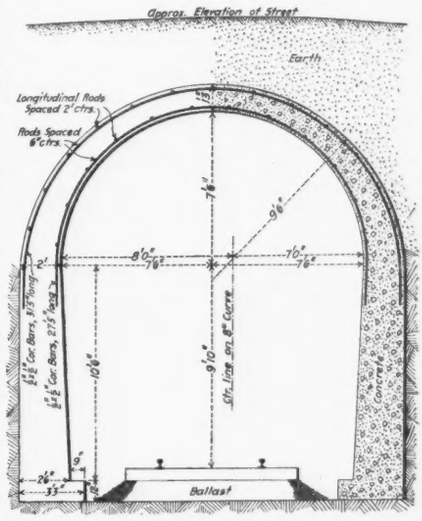
tunnel occurs. An open cut would, ordinarily, have been sufficient, but there were two streets crossing directly over the location of the proposed tunnel with several houses located on the strets. These conditions made it necessary that the streets be left open, and the surroundings remain practically unchanged after the construction of the road; hence the adoption of the tunnel.

The tunnel was built in an open cut. The material in the cut was earth for the upper 10 ft. or 20 ft., but under this earth was a ledge of solid rock, the vein running almost parallel with the center line of the railroad location. This ledge of rock dipped at an angle of about 45 deg. from the horizontal. Material in the cut was removed by scrapers and blasting, the side-slopes of the cut being left about ¾ to 1 for earth and ¼ to 1 for rock. A section of the tunnel is shown in the engravings. The roof is semi-circular on a 9-ft. 6-in. radius, the rise from springing line to crown of arch being 7 ft. 6 in., and the side walls have a slight batter from the springing line. The height of arch crown above ties is 17 ft. 4 in.

Portal of Knoxville Tunnel.

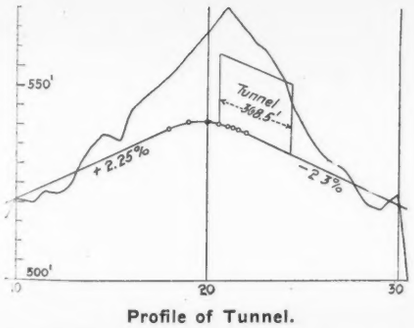
In the construction of the tunnel Old Dominion Portland cement was used. The steel reinforcement consisted of ½-in. x ½-in. Johnson corrugated bars. The arch centers were made sufficiently strong to guard against any damage that might occur from slides, as the sides of the temporary cut were at very unnatural slopes. The concrete was mixed in the proportions of 1 of cement, 2½ of sand and 5 of rock, broken to pass through a 2-in. screen. The tunnel was built in sections of from 60 to 90 ft. long, working alternately from either end. The reinforcing bars were held in place by notched planks which were removed as the concrete reached the crown of the arch. After the completion of the tunnel the excavation was filled with the original material, leaving the surface practically the same as before construction was begun.

No expansion joints were used in the en-

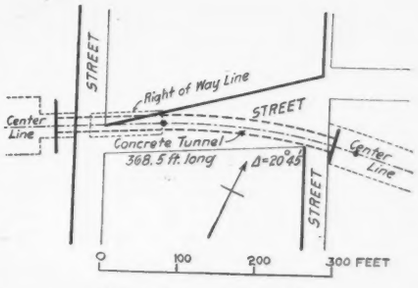


Cross Section, Reinforced Concrete Tunnel, Southern Ry.

Reinforced Concrete Tunnel at Knoxville During Construction.



Profile of Tunnel.



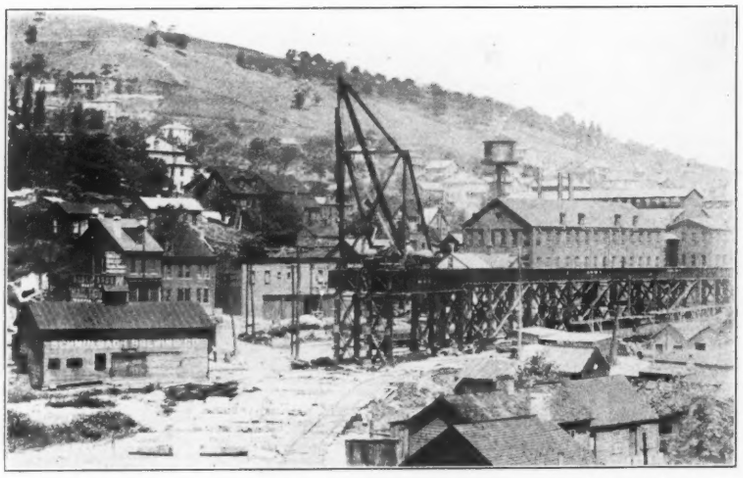
Alinement of Tunnel.

tire length of the structure, and although completed nearly a year ago, no cracks from temperature changes have appeared in the concrete. Also, during this time the railroad has been constantly in operation and the streets above have been in use as before its construction. The original estimates called for 3.41 cu. yds. of concrete per lineal foot and 72.64 lbs. of corrugated bars, at a total cost of $29.82.

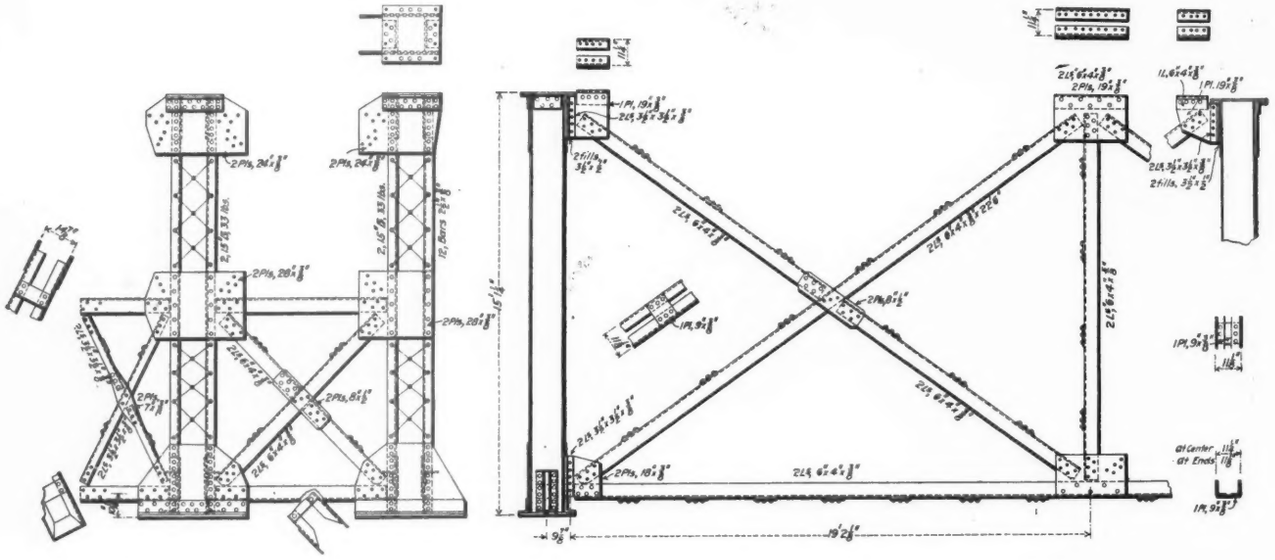
The work was under the direction of Mr. W. B. Crenshaw, Resident Engineer of the Southern. Mr. D. Meriwether, Jr., was Assistant Engineer.

Improvements on the Cleveland Division of the B. & O.

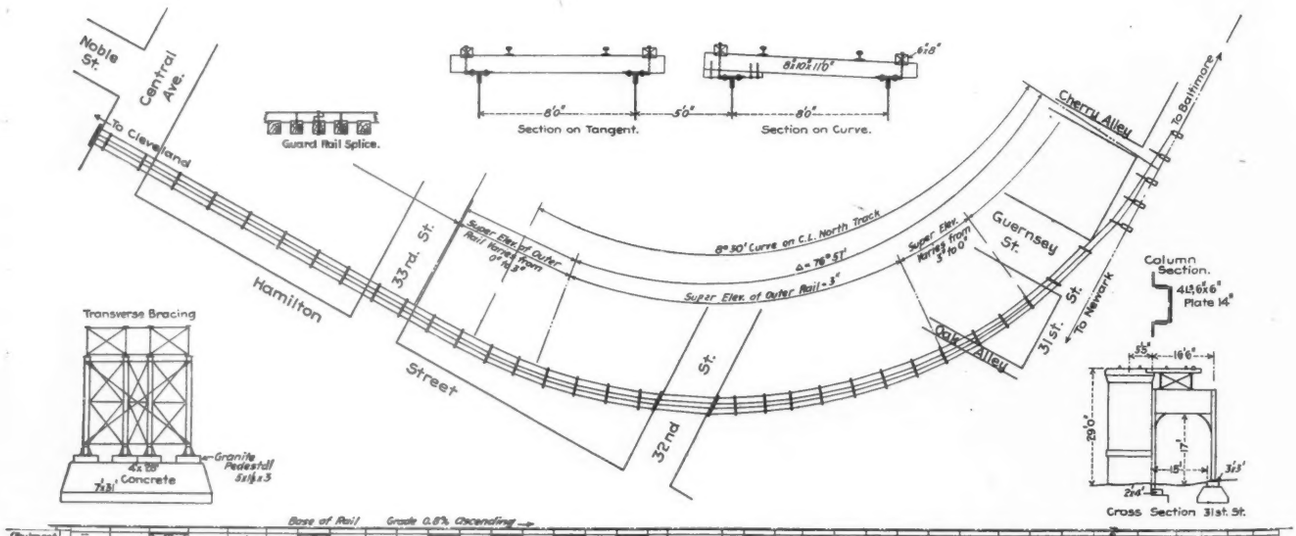
The Baltimore & Ohio has just completed extensive improvements on its Cleveland Division. The new work practically involved the rebuilding of the southern portion of the old Cleveland, Lorain & Wheeling line, straightening the line, reducing grades and



Bellaire Viaduct—C. L. & W.

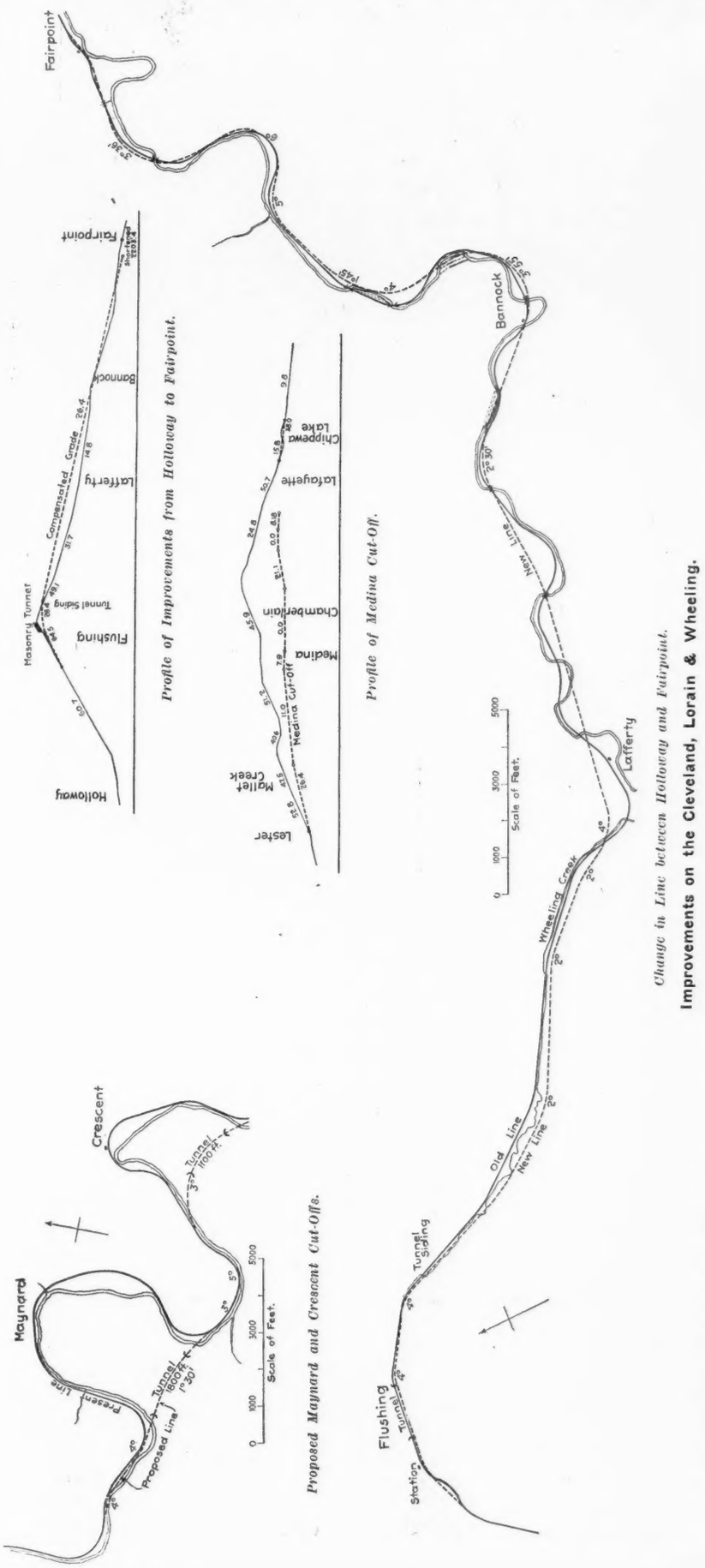


Details of Bents—Bellaire Viaduct.



General Plan and Elevation of Bellaire Viaduct.

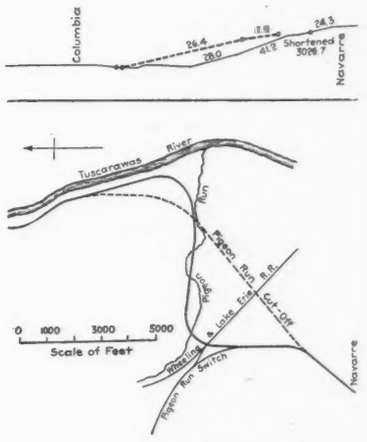
ENGINEERING SOCIETY LIBRARY, UNIVERSITY OF MICHIGAN



Improvements on the Cleveland, Lorain & Wheeling.

changing from single to double track. The work was started about two years ago and the total cost of the improvement was about $4,000,000. The average maximum grade on the division is now 0.3 of 1 per cent. (15.8 ft. per mile) northbound from Holloway to Lorain and .5 from Bellaire to Holloway, and 0.5 of 1 per cent. (26½ ft. per mile) southbound, with the exception of 3.35 miles between Holloway and Flushing, which is a helper grade of 1.15 per cent.

To make a connection with the main line of the Baltimore & Ohio at Benwood, W. Va., it was necessary to build a line a distance of about one mile from the end of the bridge across the Ohio river at Bellaire to come to grade with the Cleveland, Lorain & Wheeling, the old line of which terminated considerably below the bridge tracks. A steel viaduct was erected over the streets of Bellaire and across the Cleveland, Lorain & Wheeling yard, and the Ohio river bridge was replaced by a new and heavier structure. These improvements permit a direct movement of trains going west with the Cleveland Division. Trains can now go directly from Wheeling and the Fairmont, W. Va., coal region via Benwood Junction across the Ohio river and down over the new line to the Cleveland, Lorain & Wheeling and on to Cleveland and Lorain, or out over the Central Ohio road to Zanesville.



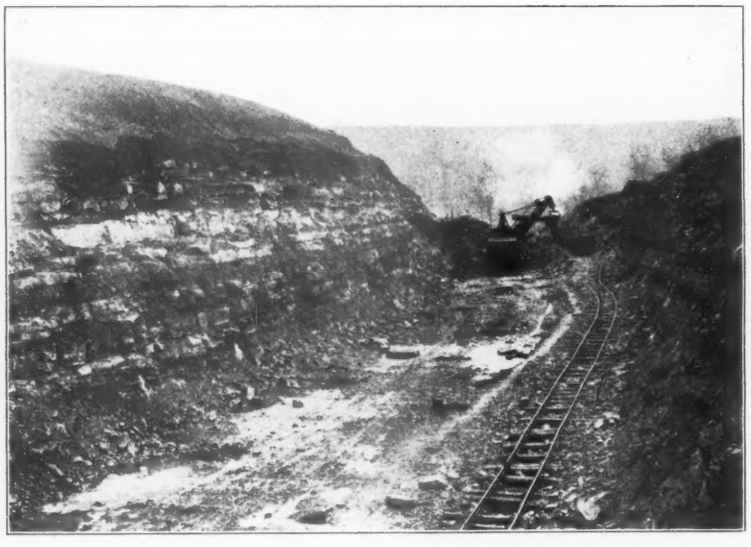
Pigeon Run Cut-off—C., L. & W.

The most important work done on the Cleveland, Lorain & Wheeling was the new line between Bellaire and Flushing, a distance of about 30 miles. Nearly all of this is new work and new right of way had to be obtained. This improvement includes the viaduct at Bellaire, the double tracking of the Barton tunnel, the new double-track tunnel at Flushing, and a deep cut one mile east of Bannock. Starting at the south end of the line, the first important piece of work is the Bellaire viaduct. This is 1,612 ft. long, 990 ft. of which is on an 8 deg. 30 min. curve. It is a steel structure, with steel work furnished by the American Bridge Company. The viaduct is made up of a number of 40 to 60 ft. spans supported on steel bents, the details of which are shown in the accompanying engraving. The 60 ft. girders are 5 ft. 3¼ in. deep. They are made up of two angles 8 in. x 8 in. x ⅝ in., and three cover plates; one 18 in. x ½ in. x 60 ft., one 18 in. x ⅞ in. x 36 ft. 9¾ in., and one 18 in. x 7/16 in. x 26 ft. 11¾ in. The web plate in the 60 ft. span is 63 in. x 7/16 in. The 40 ft. girders are 5 ft. 3¼ in. deep and are made up of two angles 6 in. x 6 in. x ⅝ in. and one cover plate 16 in. x ½ in. x 39 ft. 5 in. The web plate in the 40 ft. girders is 63 in. x ⅜ in. A number of bridges were also erected in Bellaire involving the use of up-

wards of 18,270 yds. of masonry on 2,200 lineal ft. of track.

The next important piece of work was the widening of Barton tunnel. This tunnel is 455 ft. long and the method used in double-tracking it and keeping traffic open at the same time is shown in the accompanying illustration. The roof and sides of the old tunnel were timbered to prevent caving in, before the excavation for the new section was begun. As the work on the new section progressed, the roof inside was shored up as shown, and as soon as a section of the new tunnel was completed, tracks were laid to facilitate the removal of excavated material. It took 15 months to complete this improvement. The James F. McCabe Co. were the contractors, at a contract price of $140 per lineal foot, including the portals. The west end of this tunnel was extended 14 ft. to accommodate the Wheeling & Western Railroad Company (Electric) which desired an overhead crossing at this point. The Baltimore & Ohio preferred to extend the tunnel rather than to have a bridge built directly over its portal. The electric company stood the expense of the extension, which amounted to $3,528.

Double-Tracking the Barton Tunnel—C. L. & W.



Gosset Cut—C. L. & W.

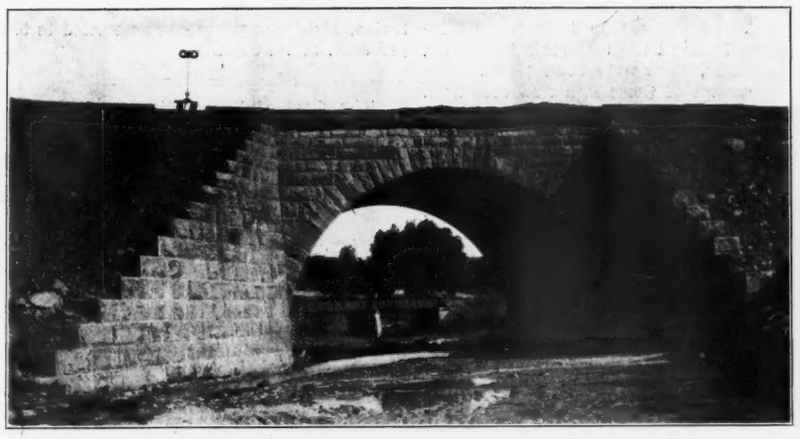
Between Barton and Fairpoint, two cut-offs are proposed. These are known as the Maynard and Crescent cut-offs, respectively, and are shown in the illustrations. The proposed Maynard cut-off includes a 1,850 ft. tunnel. This cut-off will shorten the distance about 1½ miles and will reduce curvature about 401 deg. The proposed Crescent cut-off includes a tunnel 1,170 ft. long and will shorten the distance about 4,240 ft. and reduce the curvature about 219 deg.

From Fairpoint to Flushing, a distance of 10 miles, the line has been shortened 2,203 ft., and the grade reduced from a maximum of 49.1 ft. per mile to a compensated grade of 26.4 ft. per mile. The curvature between Bridgeport and Flushing has been reduced 912 deg. 36 min., leaving the maximum curvature 6 deg.

One of the illustrations show the Gosset cut one mile east of Bannock. This cut is 900 ft. long and it was made through solid layers of limestone ranging from 2 in. to 2 ft. thick. Upwards of 73,026 cu. yds. of material was taken from this cut, which is 46 ft. deep by 41 ft. wide, and is the deepest cut on the line. The majority of cuts on the new line were contracted for at from 45 cents to 57 cents per yard. An illustration is also shown of a 44 ft. arch at Lafferty, about two miles west of Bannock. This shows the typical type of masonry arch used throughout the line. Practically no concrete was used in the improvements, since it was believed that masonry work could be put in almost as cheaply, with sandstone procured along the line of improvements. The new road at Lafferty is located about 300 ft. from the old line, and in the illustration of the 44-ft. arch the girder bridge on the old line can be seen in the background. This bridge has been taken down and the old line at this point has been entirely abandoned. All new bridges and arches were designed for the E 50 loading. The drawing of the Walker's undercrossing shows an interesting solution of the way to span a stream and a roadway at the same time.

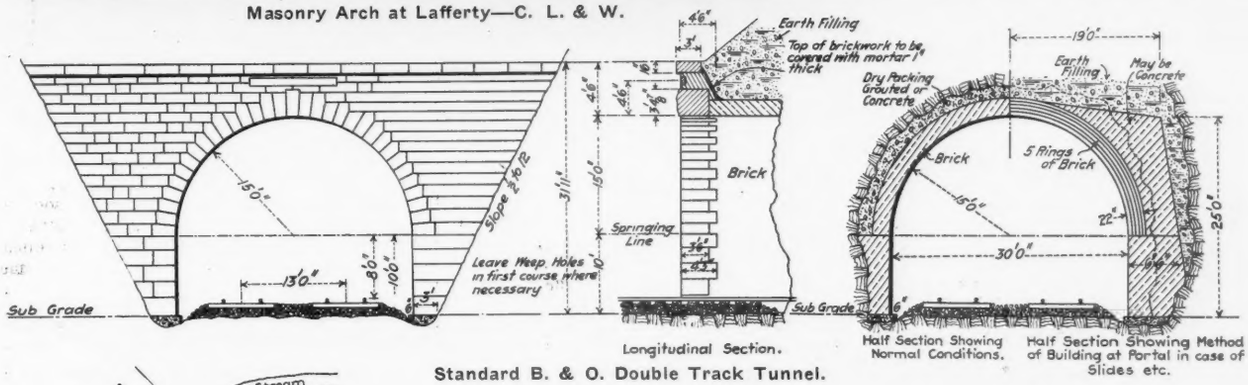
Another heavy piece of work is that of the new tunnel at Flushing. The length of the old Flushing tunnel was 1,452 ft. It was single-tracked, and owing to the 1.15 per cent. grade in it, it was apt to become full of gas and hard to ventilate. This tunnel was abandoned, as it was decided that it would be cheaper to put through an entirely new tunnel than to double track and reduce the

Walker's Undercrossing—C. L. & W.

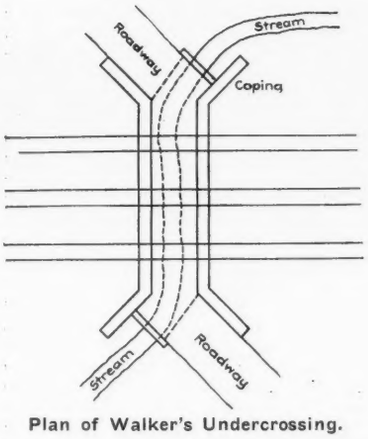


Masonry Arch at Lafferty—C. L. & W.

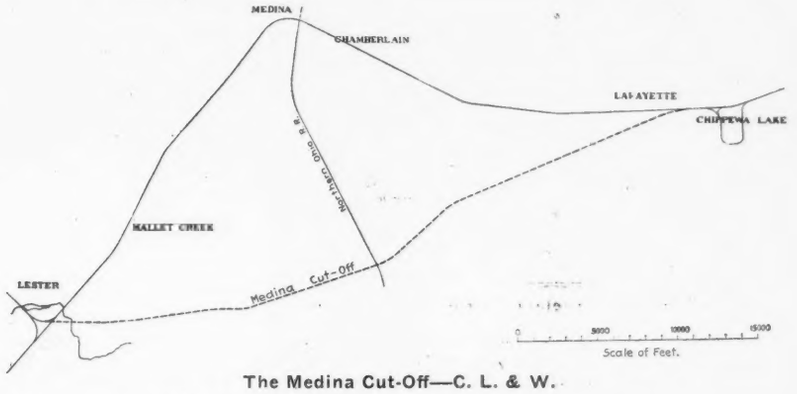
grade in the old one. The new tunnel is double-tracked and is 1,545 ft. long, built of masonry lined with brick, and is of the standard B. & O. section, as shown in the accompanying illustration. It is 45 ft. from the old tunnel and has a 0.3 per cent. grade. It took 20 months to drive this tunnel as blasting was necessary all the way through. Considerable trouble and delay was also experienced on account of running into some old coal mine rooms. This necessitated shoring up and strengthening the tunnel at these points. Bennet & Talbott were the contractors, the contract being at $145 per lineal foot. It is rather amusing to note that the railroad company had offers to lease the old tunnel for raising mushrooms, but these offers were declined and the old tunnel is now bricked up at both ends so as to prevent its becoming a harboring place for tramps.


Earth Filling
Top of brickwork to be covered with mortar 1" thick
Brick
Springing Line
Leave Weep Holes in first course where necessary
Sub Grade
Longitudinal Section.
Dry Packing Grouted or Concrete
Earth Filling
May be Concrete
5 Rings of Brick
Half Section Showing Normal Conditions.
Half Section Showing Method of Building at Portal in case of Slides etc.

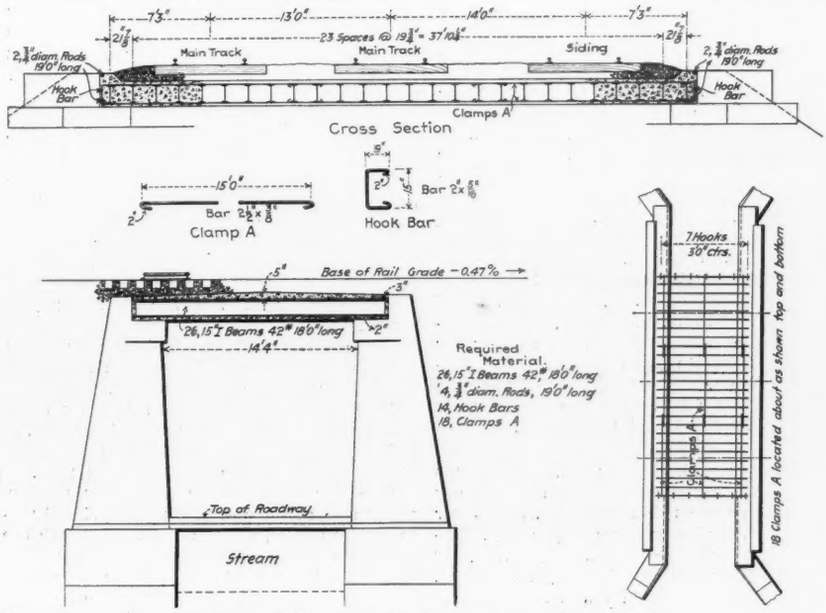
Standard B. & O. Double Track Tunnel.



Plan of Walker's Undercrossing.



The Medina Cut-Off—C. L. & W.



Details of Walker's Undercrossing—C. L. & W.

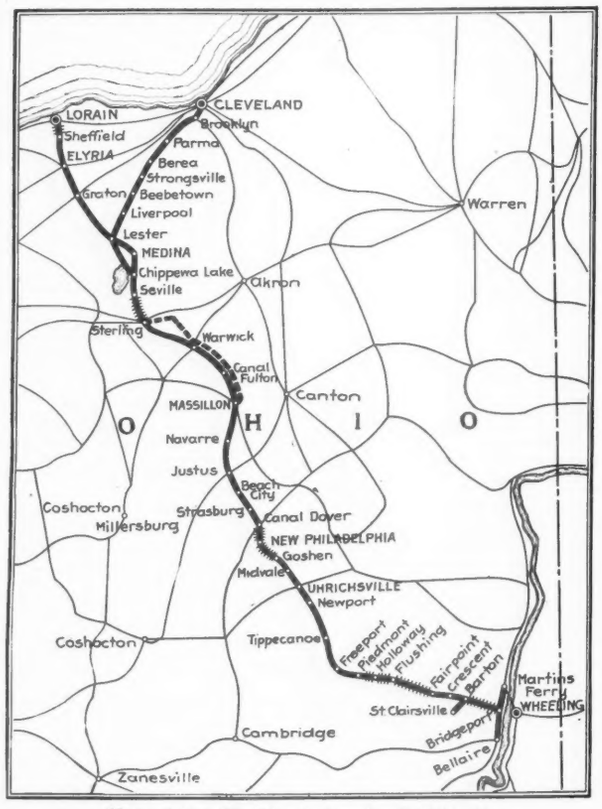
It was also thought that a better draft could be obtained in the new tunnel by closing the old tunnel, because of its proximity to the new one.

The longest fill on the line commences about half a mile east of the Flushing tunnel. It is 4,200 ft. long, with a maximum height of 20 ft. The permanent way on this fill is for three tracks and contains 148,000 cu. yds. of material, most of which was taken from the east approach and heading of the Flushing tunnel.

A new division terminal was made at Holloway, where modern facilities have been provided for handling locomotives and trains. At Holloway, four miles west of Flushing, the Cleveland Division and the Wheeling Division meet and train crews are run from this point north and south. The terminal improvements consist of a large freight yard, two miles long, a machine shop, a 22-stall frame roundhouse, two water tanks, an ash pit and a large reservoir. The reservoir has a capacity of 59,000,000 gallons and it will be used to supply the engines with water and to prevent a famine during the dry season. The Holloway yard has a capacity for about 1,200 cars, distributed as follows: Westbound receiving yard, 195

cars; westbound distributing yard, 520 cars: eastbound receiving yard, 450 cars. The east and west main line track of the C., L. & W. run on each side of the yard and all westbound cars are distributed over a hump. All yard switches are thrown by hand.

During the progress of the work, upwards of $120,000 was expended in changing the channels of the Stillwater and Wheeling creeks. The channels of each of these creeks were changed at two points. These changes eliminated eight bridges, and by change of line four additional bridges were done away with, making a total of 12 bridges in all that were eliminated along the new line. A number of passing sidings were also put in. These are of the standard B. & O. length of 6,700 ft.



Map of the Cleveland, Lorain & Wheeling.

Between Holloway and Navarre the old line was in fair condition and no heavy work had to be done, but between Navarre and Columbia, a distance of 2½ miles, the line has been shortened about 3,026 ft. This improvement is known as the Pigeon Run cut-off and the maximum grade between the above points has been reduced from 41.2 ft. per mile to 26.4 ft. per mile. The curvature has been reduced 179 deg., and the maximum curvature is 2 deg. It is claimed that this improvement has increased the hauling capacity of the engines about 60 per cent. In all grade revisions, either double track is laid or provision is made in permanent work for laying double track in the future. It was thought best to grade to the full width while at work rather than to build up the grades when it comes time to double-track the line, later on.

An important piece of work was done between Chippewa Lake and Lester, known as the Medina cut-off, and consisting of about ten miles of track. It shortens the old line by about 1½ miles and the maximum grade between the above points has been reduced from 52.8 ft. per mile to 26.4 per mile. The curvature between these two points has been increased 5 deg., with a maximum curvature of 2 deg. Improvements to meet the increased business at the terminals in Lorain, on Lake Erie, have also been made. The most important of these is a new coal dock 700 ft. long.

This dock has been equipped with a Link Belt conveyor, telescopic chutes and chute tower and a new engine and boiler. New track was laid and a considerable amount of dredging had to be done so that vessels could get up to the dock. The property used for the dock improvements was bought by the Baltimore & Ohio over a year ago at a cost of $130,000, and the new dock cost about $90,000. This work, with the new terminals at Holloway and the improvements on the Cleveland, Lorain & Wheeling, gives the Cleveland Division of the Baltimore & Ohio a low grade line to the Great Lakes, which permits of a prompt and easy movement of the large volume of coal from West Virginia points. The Cleveland, Lorain & Wheeling now has 57 miles of double track between Cleveland and Wheeling, a distance of 162 miles. For eastbound traffic it runs over its own right of way from Cleveland to Wheeling, and for westbound traffic from Wheeling to Cleveland, it uses both its own line and that of the New Castle Division of the B. & O. as well as part of the Massillon & Cleveland. The accompanying map shows the C., L. & W. line and the lines over which the C., L. & W. has traffic rights.

The heavy line shows the C., L. & W. Division of the B. & O., and the cross-hatched portions shown at different points along the line indicate the portion of the line which is double-tracked. The heavy dotted line between Sterling and Warwick indicates the part of the New Castle Division of the B. & O. which is used as the C., L. & W. westbound main line, and the heavy dotted line between Warwick and Massillon shows part of the Pennsylvania line known as the Masillon & Cleveland, which is also used as westbound main line by the C., L. & W. The total double track on the C., L. & W., as stated above, is about 57 miles. Twenty-four miles of this is made by using the two foreign lines as indicated, and 33 miles of it is C., L. & W. track proper. By using the Medina cut-off about 8½ miles additional double track is obtained.

For the above information and drawings we are indebted to D. D. Carothers, Chief Engineer, and to W. B. Hanlon, District Engineer. The masonry and bridge plans for the improvements from Holloway to Bellaire were made at the Baltimore office of the B. & O. from situation plans which were furnished by the District Engineer.

The German Dining Car Co., which owns 45 dining cars and conducts the dining car business on some railroads which own their own cars, was able to pay a 10 per cent. dividend on its moderate capital of $476,000, for the fiscal year ending with September last. The company pays some of the railroads for the privilege of having its cars in their trains, and these payments amounted to 5.85 per cent. of its capital.

The Cost of Locomotive Operation.

BY G. R. HENDERSON.

(*Continued from page 191.*)

FUEL.

Firing.—When the coal has been placed upon the tender, the uncertainty regarding its value for generating steam has by no means come to an end. It is now used for two purposes; for getting up steam in the house, and for hauling trains on the road. The first proceeding is unremunerative and very uncertain, depending largely upon how long and where the engine stands after the fire is lighted. Ordinarily it should be a very simple matter to say how many pounds of coal would be required to bring the weight of water in the boiler and the material of the boiler itself up to a temperature corresponding to the steam pressure carried. In some tests made upon the Santa Fe, locomotives of quite a large size consumed from 1,200 to 1,660 lbs. in firing-up, the time occupied being from four to six hours, but how often does an engine go on duty as soon as fired-up to the proper pressure? What a common sight if we go to a large roundhouse on a winter's night, to find 10 or 20 locomotives standing outside, perhaps in a storm, their gages all near the working pressure, and nearly one-half of them blowing off through the safety valves! In his anxiety not to delay trains, the despatcher has perhaps ordered all the locomotives available, and while the trains for which they are intended may not all be in for five or six hours, in the meantime fuel is burnt without producing any useful work. The amount of steam escaping through a 2½-in. safety-valve every minute that it is relieving pressure represents the evaporation caused by burning 15 lbs. of coal—sufficient to haul 100 tons for one mile on a road of easy grades, and it is therefore not to be wondered at that enginemen who are interested in their coal record, ask for allowances to their credit when engines are compelled to stand under steam, and the fuel used is reckoned against their ton-mileage. Even when not blowing off, radiation alone will require from 25 to 50 lbs. an hour. As soon as the locomotive starts on its trip the fireman's efficiency becomes a factor in the problem, and a very important one. If he fills the air with clouds of black smoke; if he throws in large lumps without breaking them, or fires six or eight scoopfuls at a time instead of two or three; if he allows the engine to blow off; if he fires aimlessly, not observing where the coal is needed, or carries a very heavy fire; if he neglects the proper use of dampers or disregards the actions of the engineer in handling the engine, it cannot be expected that anything like the full value of the fuel will be obtained, and a great deal more coal will be used in doing a certain amount of work than with a man who fires intelligently and practices none of the bad methods just enumerated.

There is practically no limit to the various books and articles of instruction regarding the proper firing of locomotives, and while it is not in the province of this work to go into the detail of making a good fireman, it is important to explain the great cost to any railroad of careless or incompetent men.

In order to stimulate a healthy rivalry, many roads keep and post up individual performance sheets, which show each month the amount of fuel per ton-mile which the several men have used in different classes of work on the division. Unless these be properly grouped for comparison, they are worse

than useless, and discourage the men instead of stimulating them to give better service, and this is the difficult part of the problem. If one man has caught more fast freights or stock runs than his competitors during the month, he cannot be expected to show as low a fuel rate as the others, and if it be insisted that he can, he will feel the injustice of the charge and lose interest in the proceeding. Where a number of men have definite runs that are practically similar, such comparisons may be drawn with evident advantage to the industrious and willing employee and the company, as for instance, in passenger trains, where two crews run alternate days; if one crew has more lost time from another division to make up, they will probably obtain a poorer mark, but will be able to explain when desired to do so. Perhaps the most satisfactory method is to group the men each month, according to their service, as nearly as possible, even if only four or five appear in a group, or sometimes only two. If after four or five months are compared it is found that certain men are continually below (or rather above in amount of fuel used) the average of the group in which they are placed, it is a good indication that they are doing poorer work than the average of their competitors. It may be due to the grouping, or to a large number of fast runs, as indicated above, but if the arrangement of the men be carefully performed, the conditions should average themselves in the course of a few months so as to demonstrate who are the careless parties. If large groups of figures are published regularly, they do not often appeal to the men as forcibly as some mark, suggestive of a better or poorer performance than the average of the group; besides, the men will keep a tally of their coal tickets, and attempt to check up the amounts stated in the bulletins, with the result frequently of a disagreement in the figures. Then confidence is lost in the company's statistics, and complaints are frequent and emphatic that the statements "are not worth a ——," and that it is not just to judge them by the monthly sheets. On the other hand, if it is simply shown that John Doe is always below the average of his group, he either must have some good reason (which can and should be investigated) or the fault lies with himself, until he is able to demonstrate otherwise. It is just such difficulties as above enumerated that have caused the abandonment of the coal premium system on most roads, as it was extremely hard, if not impossible, to pay justly for saving in fuel.

Running.—We have given considerable space to the duties of the fireman in economizing fuel, and the methods of recording the same, but it must be remembered that the engineer is the responsible party on the engine, and that he has much to do with the proper use of the coal, and is even more interested (or should be) than the fireman. As a graduate from the "school of the scoop" he should instruct his fireman, where necessary, and endeavor to cultivate in him an interest in his work; he should also assist him to make a record by working his engine in the shortest cut-off possible consistent with the work he has to do, using a liberal throttle opening, taking the full card time between stations, uniformly distributed (unless making up lost time), operating the injector as evenly as possible throughout the trip, and keeping his fireman posted beforehand of his intended movements in the operation of the locomotive.

The road foremen must see that the engineer and fireman are working in harmony and that they fully understand the importance and methods of economy, without interfering with the proper movement of trains, or the observance of orders.

What was said about the fuel records of firemen applies equally to the engineers; in fact, where they run together they are grouped side by side in the statement. Occasionally, however, it is necessary to make out separate statements for engineers and firemen, but the same form and arrangement will answer.

These matters have been studied at some length on account of their importance on the cost of fuel, and for the purpose of demonstrating the still further difficulty of expecting exact figures for this item. If all men had the same intelligence, skill and willingness, this factor could be overlooked, but the "personal equation" is what really constitutes individuality, and nowhere in locomotive operation is it more a matter of financial interest than on the locomotive footboard. As supervision of the actions of the engine crew in detail is impossible, the variation in results can be readily appreciated.

Design.—The detail proportions and the arrangements of the locomotive have much to do with the fuel consumption. In fact, some kinds of coal require special appliances for burning them properly. Thus in order to burn anthracite culm, a fuel which could be obtained on the line of the Lackawanna Railroad for a very small price, it was necessary to design boilers with enormous grate surface, and also to use grate bars specially suited to the fuel. This has been done successfully, but could not have been attempted without these modifications. The Philadelphia & Reading at one time burned soft coal, and when it desired to return to anthracite it was necessary to change the back end of the boilers; of course hard coal could have been burned upon the smaller grate, but not in sufficient quantities to generate the desired amount of steam. These cases are cited merely to show the importance of design to fuel combustion.

The effects of some special features are well known—of others they are more or less problematical. Compounding, when the engines are in good condition, may be expected to diminish the coal consumption 10 or 20 per cent. below simple engines, for the same amount of work; if there are leaks and blows (and in some cases these are much more prevalent and difficult to repair than in simple engines) the saving may disappear or become negative; then it has sometimes been found that where the division consists of a long gradient in one direction, the steam used by a compound in order to cause it to run swiftly down hill, may very nearly equal the economy of the up-hill trip, thereby leaving a very small balance in its favor. The most advantageous line for such an engine is evidently one where steam can be used liberally for the whole running distance; that is, a nearly level stretch of track.

If the engine be equipped with a superheater we may expect economies which compare favorably with the compound. Approximately, we should obtain 5 or 6 per cent. fuel economy for every 110 deg. of superheat, so that we need not look for as good a performance in an ordinary boiler. Of course, in computing or estimating the consumption of fuel for a given work, these features can be allowed for, but in any case they should not be overlooked.

Large grates and piston valves also tend towards economy, and while it is frequently stated that they will produce 10 per cent. if judiciously applied, it is not so easy to compute this definitely as in the cases previously quoted. These points are mentioned to show the effect of design upon the economy of fuel, and as most railroads have many of these varieties running over the same divisions, a close correspondence between them in coal consumption cannot be expected. They all exert an influence upon this most important question, but just how far can seldom, if ever, be exactly stated. Minor details, such as the size of port, length of stroke, boiler covering, etc., all contribute towards economy or extravagance, according to the skill of the designer and the service to which they are applied, but the exact amount of their influence will perhaps never be known.

Condition.—But if the design is important the maintenance is even more so. As has been hinted in speaking of compounds, inattention in the roundhouse or shop will easily destroy the saving product, or that should be produced, by the special feature, to obtain which an additional expense has been incurred. Blowing packing or a leak in the boiler will offset a good many per cent. of saving, and when we see a locomotive surrounded by a cloud of steam we know that such steam has not performed its intended work, otherwise it would come only from the stack. In a recent trip over one of our transcontinental lines, on some divisions it was a rare occurrence to find a boiler that was not leaking—this may be due to the nature of the water or fuel used, but nevertheless the waste existed.

Cut valve seats, allowing steam to blow through to the exhaust; injectors that do not shut off cylinder cocks that do not seat properly; are all sources of waste that are caused by imperfect maintenance. Improper adjustment of the draft diaphragms, affecting the steaming, or an excessively small nozzle, whereby large percentages of unburned fuel pass through the stack are an evidence of insufficient care in the roundhouse. Neglected boiler washing, allowing scale and sediment to accumulate on the heating surfaces, besides injuring the metal, causes a loss of heat by the non-conducting qualities of the deposit. In some tests made by the Illinois Central, a thoroughly cleaned boiler showed 13 per cent. increase in steam making power (see *Railroad Gazette*, Jan. 27, 1899) over what it had done previous to removing and cleaning the flues. Of course we cannot obtain such a difference by merely washing out, but this shows the necessity of watchfulness along this line.

The care of the jacket is also important, as if engines are allowed to run with portions of the jacket removed, the radiation from the uncovered surface causes an additional loss of from one to two British thermal units per square foot per hour per degree difference in temperatures between the inside and outside of the boiler. These all show the importance of maintaining locomotives in prime condition, if economy is to be obtained, and the relative importance of the different processes can be understood from the foregoing.

With all these variables which have been enumerated, affecting the quantity and value of the fuel, it is not difficult to understand the impossibility of prognosticating or even obtaining the actual amounts used in moving trains, both in pounds and dollars, for any given case or for a group of engines. However, the effects of grade, speed, load, etc., are so very prominent that they outweigh most of the variables above noted—in fact, these very uncertainties may actually balance each other, some, but not all, being present in nearly every locomotive, and the result being a general reduction in the work performed per pound of coal, which may be covered in the assumed unit of performance. Besides these physical characteristics can be properly considered in the ratio of their effects, that is, if such a grade, etc., requires so much fuel, another one will require a definite proportion of the first, practically eliminating consideration of these variables.

(To be continued.)

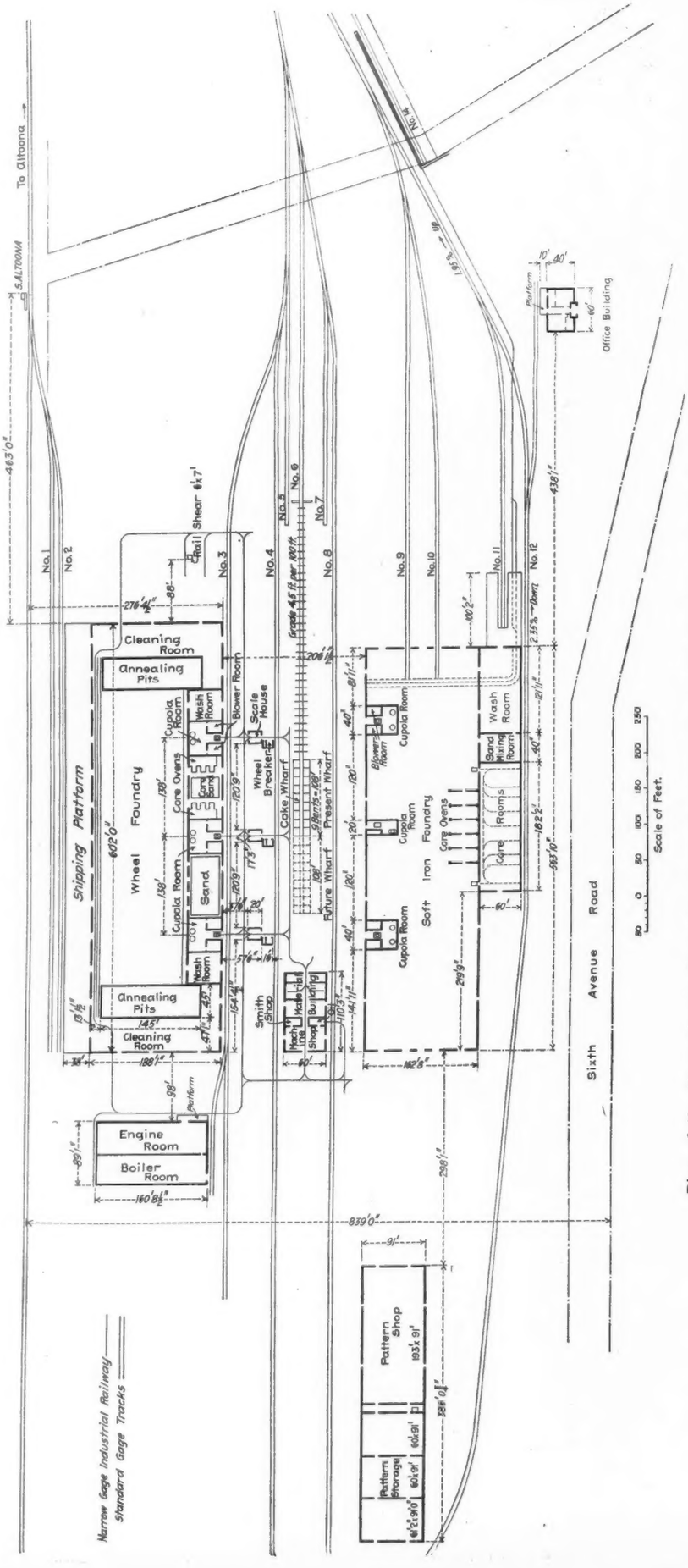
The New Wheel Foundry of the Pennsylvania at Altoona.

For a number of years the Pennsylvania has been making part of the cast-iron wheels which it requires at two foundries which form a part of the Altoona shops. One of these foundries was used exclusively for making wheels and the other was used for making both wheels and miscellaneous castings for locomotive repairs. Each had a capacity of about 220 wheels a day when running full time, but this was not sufficient to meet the requirements. The facilities in both of these foundries were old and economical production was not possible. There was no room for enlargement as the shops are badly crowded together, and, in fact, the space occupied by the foundries was urgently needed for other shops more necessary for the repairing of locomotives.

About two years ago the Pennsylvania bought a large tract of land in South Altoona about 2½ miles from Altoona, on the Hollidaysburg branch, and plans were made for the erection of a new and modern wheel foundry, a gray-iron foundry, pattern shop and storehouse and a brass foundry, thus bringing together in one plant all of the buildings and machinery necessary for producing all of the castings of every kind except steel and malleable iron which the company uses at Altoona and in other shops on the system. Work on the buildings was begun soon after and last November part of the wheel foundry was put in operation. The wheel foundry building, power house and office building are now completed, the gray-iron foundry building is under roof, and the foundations for the pattern shop and storehouse have been begun. For the present, the brass foundry will not be built but space has been provided for it in the layout of the buildings.

The accompanying general plan shows the location and arrangement of buildings and tracks. There are six main buildings, an office building 40 ft. x 60 ft., the wheel foundry 188 ft. x 602 ft., the gray-iron foundry 162 ft. 8 in. x 563 ft., with a bay for core room and washrooms 60 ft. x 344 ft., the pattern shop and pattern storage 91 ft. x 386 ft., part of which is three stories high, power house 89 ft. 1 in. x 160 ft. 8½ in., and material storehouse 60 ft. x 110 ft. 3 in. All of the shop buildings are of brick with steel roof construction. Standard gage tracks are laid through the grounds from one end to the other, passing close to all buildings so that materials and finished castings can be loaded on and off cars direct without hauling. A system of narrow gage industrial tracks is also laid in and around the two foundry buildings for carrying material through the shop and from the storage house.

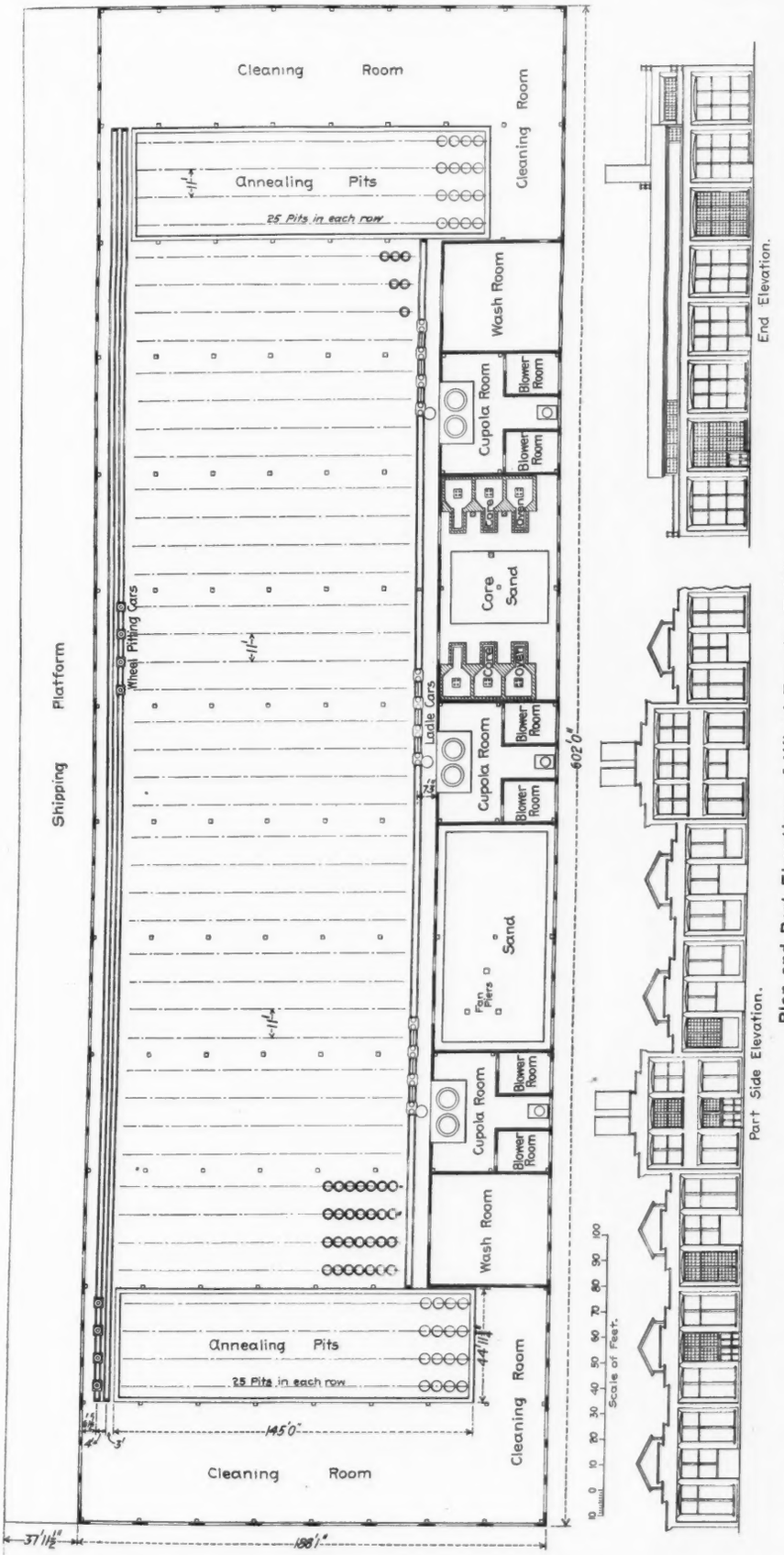
The wheel foundry is the largest and most important building of the group. It is laid out with straight parallel molding beds holding 25 molds each with overhead trolley hoists running on I-beam tracks suspended from the roof trusses and serving each row of molds. This is a distinct advance over the old method of molding on circular beds served by a post crane, both in ease and rapidity of molding and pouring and in saving of floor space. The arrangement of cupolas and molding floors is virtually that of three separate foundries placed along side of each other under one roof, each pair of cupolas serving three bays of four molding floors. An annealing pit and cleaning floor occupy each end of the building and the space along the east side of the foundry is utilized for the core room, sand storage, cupola rooms and wash room. The entire west side of the building and the end walls are almost all glass so that with the additional glass in the roof louvres the lighting



Plan of the Pennsylvania Foundries at South Altoona, Showing Location of Buildings and Tracks.

is admirable, even on dark days and when pouring off.

The six cupolas are of the Paxson-Colliau, slagging type, 58 in. in diameter inside of lining, and have a capacity of 12 tons an hour. They are arranged in pairs just back of the partition wall between the molding floor and the cupola room. The tap holes are about 8 ft. above the floor and the two spouts project through the wide opening in the wall, coming together at their outer ends over the receiving ladle. Blast for the cupolas is supplied by four Sirroco fans and two Sturtevant fans delivering air at a pressure of about 14 in. of water. Each fan is mounted in an enclosed space at the back of the cupola room on the first floor and is driven by a belt from a 60-h.p. motor.



Plan and Part Elevations of Wheel Foundry Building.

The cupola room is carried up to two stories and the charging platform is on the second floor. A hydraulic elevator raises the small cars which are loaded with the charge of coke and iron outside the building. Tracks run from the elevator across the charging floor to the door of each cupola, and the charge is dumped by hand through the charging doors.

Under the tapping spouts of each pair of cupolas is a receiving ladle mounted on trunnions and tilted by a chain wheel. The chains for tilting are connected to two hydraulic cylinders under the floor, which are controlled by a valve conveniently placed against the wall. These ladles have a capacity of seven tons. Running along in front of the ladles is a narrow gage track for the ladle cars. The arrangement of these cars is shown in one of the drawings. They consist of a shallow box mounted on four small wheels, and four of them are coupled up together, the couplings being of the proper length to space the cars 11 ft. apart, center to center, the same distance as between the molding floor trolley runways. An endless rope drive running between the rails and up to the motor-driven winding drum mounted on the roof trusses is used for moving them. The controller for the winding drum is placed near the valve controlling the tilting of the reservoir ladle so that one man can operate both. The travel of each train of cars is limited by the arrangement of the winding drums and ropes to the three bays of the molding floor served by one pair of cupolas.

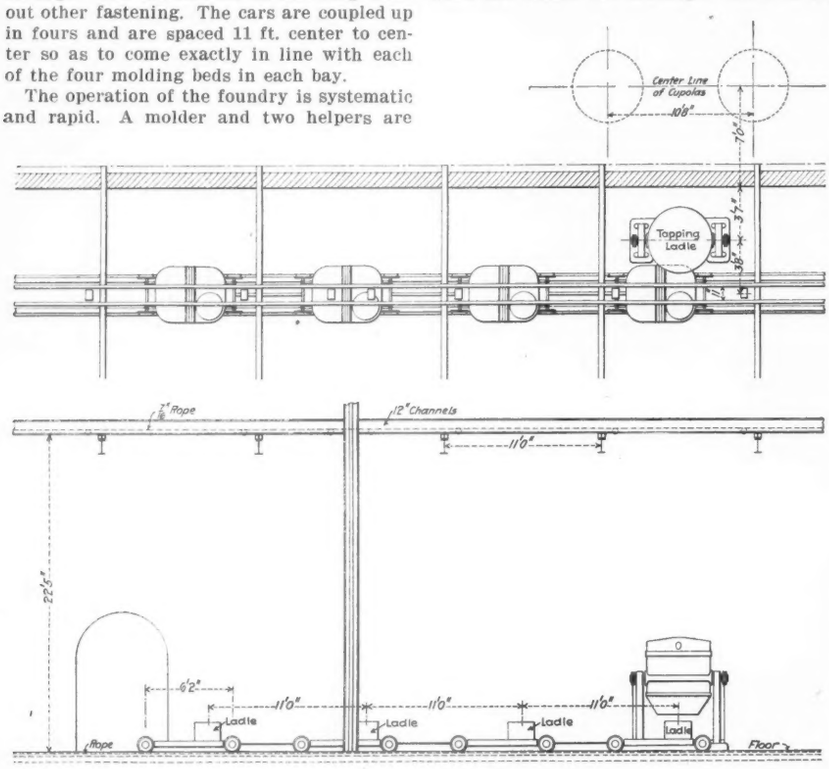
The trolley hoists serving each row of molds were supplied by several different makers, but all are essentially the same, having two hoisting speeds and two traverse speeds with one controlling lever for both movements. The maximum hoisting speed is 30 ft. per min. at full load and 75 ft. per min. at light load, and the maximum traversing speed is 350 ft. per min. at full load and 400 ft. per min. at light load. Each hoist has two 2½-h.p. enclosed motors and the capacity is 3,000 lbs. Current is collected by contact wheels running on wires strung outside of the top flange of the I-beam track. The controller is an ingenious but simple device. An outrigger arm is attached to the hoist frame and carries a hollow horizontal shaft with a second shaft inside, one being connected to the controller of the traverse motor and the other to that of the hoisting motor. At the outer end of the hollow shaft is a bevel gear meshing in a gear on top of the vertical rod of the controller handle. The inside shaft carries a horizontal rod with wires at the ends leading down to the cross-bar of the controller handle. By turning the controller handle in a horizontal plane the hollow shaft is revolved and the trolley motor started. By tilting the cross-bar in a vertical plane the inside shaft is revolved and the hoist motor started. The motors are reversed by tilting or turning the handle in the opposite direction. By dropping the controller from an outrigger the operator stands away from the molds when handling the hoist. Pawling & Harnischfeger, the General Electric Company, and the Sprague Electric Company furnished these hoists.

The molding floor is 112 ft. x 414 ft., and will accommodate 900 molds, which is a day's full run. Along the west wall of the building are two narrow-gage tracks running the entire length of the foundry on which the wheel pitting cars are run with

a cable haulage system similar to that on the tracks in front of the cupolas. The wheel pitting cars differ but slightly from the ladle cars, the body being simply a circular ring of steel plate 21½ in. in diameter and laid on edge. The wheels rest on this ring without other fastening. The cars are coupled up in fours and are spaced 11 ft. center to center so as to come exactly in line with each of the four molding beds in each bay.

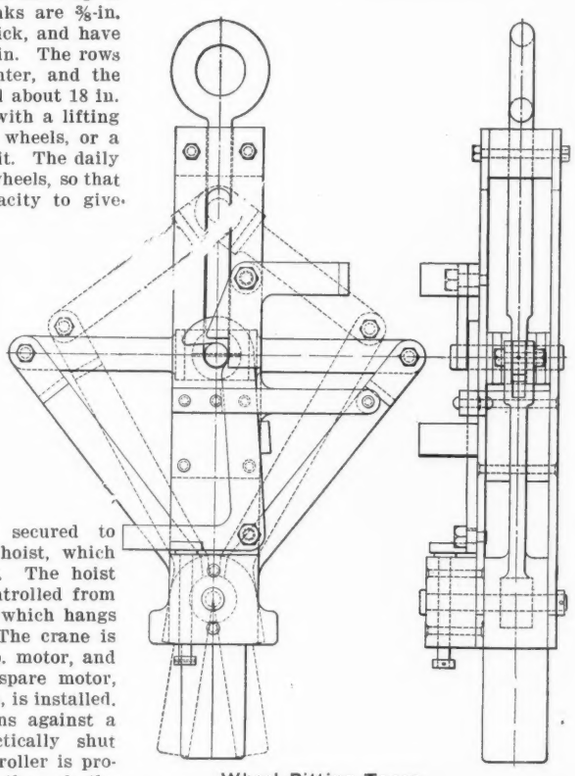
The operation of the foundry is systematic and rapid. A molder and two helpers are assigned to each row of 25 molds and are supplied with that number of flasks and chills. They begin molding in the early morning at the west or far end of the row, and proceed toward the cupolas, the cast numbers of the wheels beginning with the first mold. By 11 o'clock the day's molding is completed and pouring off begins. The blast is turned on about 10 o'clock and hot iron, which is essential for this class of work is obtained at the beginning of the run. The cupolas are tapped out into the storage reservoir from which the iron is poured into the pouring ladles on the cars. As each ladle is filled the train of cars is run forward 11 ft. and the next ladle filled. When all four are full the train is run out opposite the four rows of molds in a bay and the trolley hoists pick the ladles up, carrying them to the outer end of the row. One helper manipulates the hoist, the molder pours and the other helper skims. All four molds are poured simultaneously and the empty ladles are then run back to the cars, which have meanwhile carried four more ladles to one of the other bays and returned for the empty ones. In this way the pouring goes on continuously until the day's run is finished. After about three wheels have been poured, the cope is lifted and the wheel drawn from the sand. While it is suspended the runners are broken off with sledges and the rim is struck with several sharp blows of a sledge to knock off most of the clinging sand. It is then run out to the end of the row and deposited on one of the train of wheel pitting cars to be carried to the annealing pits. As fast as the molds are broken up, the flasks and chills are set up ready for the next day and the sand is cut, watered and banked.

The annealing pits at the ends of the foundry are duplicates of each other. They are 45 ft. x 145 ft. and are 16 ft. deep. The arrangement of the tanks and filling is shown in one of the drawings. The rubble masonry walls extend 8 ft. above the floor line and about 14 ft. below. The bottom of the pit is laid with 6 in. of concrete and slopes toward one corner for drainage. Each of the four rows of tanks rests on a concrete bench and about 18 in. of coarse broken stone is laid over the floor up to the tops of these benches. On top of this is a layer of finer stone and then green and burnt sand up to the top of the walls. The tanks are ⅜-in. steel lined with 6 in. of fire-brick, and have an inside diameter of about 40 in. The rows are 11 ft. apart, center to center, and the tanks in each row are separated about 18 in. The tank covers are cast-iron with a lifting ring. Each tank will hold 23 wheels, or a total of 2,300 wheels for each pit. The daily cast when running full is 900 wheels, so that the pits have a sufficient capacity to give five days annealing.



Ladle Car Arrangement in Front of Cupolas.

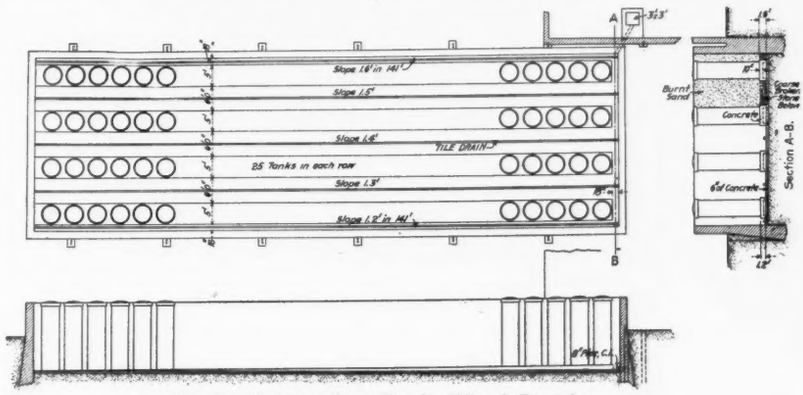
The pit is spanned by a crane carrying four independent hoists, spaced 11 ft. apart on the bridge, to cover each row of tanks. The runway extends out beyond the west end of the pit over the wheel pitting tracks, and is supported on brackets on the roof columns. A spare hoist is mounted on the bridge, and in case of a breakdown it can be moved to the proper position and secured to take the place of the broken hoist, which can be moved out of the way. The hoist motors are 7½-h.p. and are controlled from separate controllers in the cab which hangs from the bridge at one side. The crane is moved over the pits by a 10-h.p. motor, and to provide for emergencies a spare motor, which can be quickly coupled up, is installed. In addition to these precautions against a breakdown which would practically shut down the foundry, a spare controller is provided which can be connected through the switch board to any one of the hoisting or traverse motors. The speed of the hoists is 100 ft. per min. with full load and 200 ft. per min. without load, and the speed of the bridge is 500 and 550 ft. per min. The wheels after being roughly cleaned and placed on the pitting cars are run to the end of the foundry opposite the annealing pits and all four wheels are picked up simultaneously with special tongs, carried over the pit to a row of tanks already opened and dropped. These special tongs are an ingenious device and are shown in one of the engravings. The full lines show the position of the parts before lifting, and the dotted lines show the position when lifting the wheel. The two bent links are hinged at the bottom of the vertical frame and their projecting ends when brought together just fit into the rough hub of a wheel. At their upper ends they are joined to a pair of toggle links attached to the bottom of the lifting eye by a projecting pin which works in a slot in the frame. When the lifting eye is raised the projecting ends of the bent links are forced out and grip the sides of the wheel hub. Before the tongs are lowered into a wheel the right-angled arm, which has a hook at its upper end, is hooked over the projecting pin at the bottom of the lifting eye so that the weight of the tongs will not spread the gripping fingers. As the fingers drop into the wheel hub the pin shown at the bottom of the frame is forced up by the rim of the hub and forces the locking arm out of a vertical position, thus releasing the projecting pin and allowing the lifting eye to move up when a lifting force is applied. Before the wheel is lifted off the pitting cars the trigger shown at the top is thrown over so that one arm bears against the projecting pin. Then when the wheel is deposited in the pit or on the floor and the lifting strain on the eye is released, the pin moves downward in the slot in the frame. This throws the trigger over so that the notch engages on top of the pin. As the tongs are withdrawn the pin holding up the other locking arm drops and allows the hook at the top to engage with the pin. The



Wheel Pitting Tongs.

trigger is then released and the tongs are ready to pick up another wheel.

After five days in the annealing pits the wheels are taken out by the crane and deposited on the floor of the cleaning room at the east end of the pit. Here they are chipped, brushed and inspected and rolled out on to the shipping platform, which is



Details of Annealing Pits in Wheel Foundry.

38 ft. wide and extends the whole length of the building. The track for loading cars is depressed so that the car floors are on a level with the shipping platform and the wheels can be rolled on board without lifting.

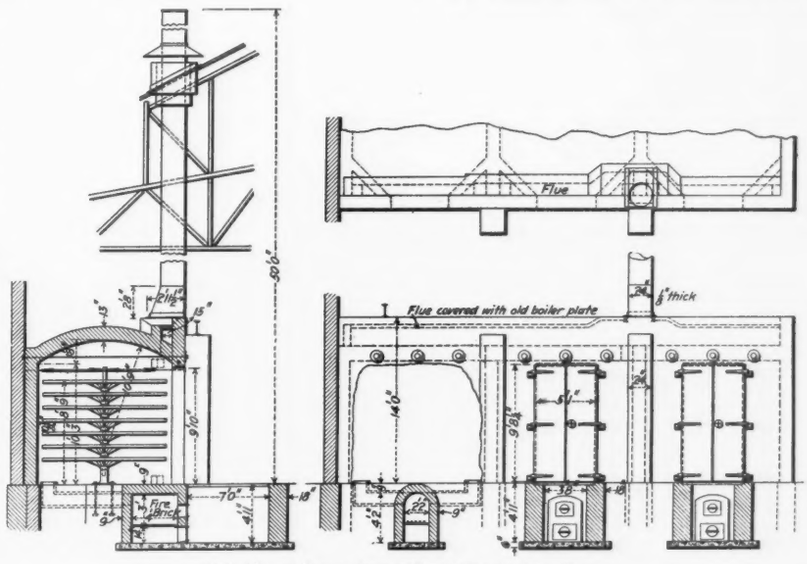
The core room is located about in the center of the east side of the building between the two cupola rooms, and is 46 ft. x 88 ft. Two sets of core ovens are provided. The drawings show their construction quite clearly. Each oven contains seven circular shelves mounted on ball-bearings on a central shaft and turning independently of the others. Each shelf will hold 41 ring cores or 287 cores per oven. The grate is below the floor line and the coke is fired from a pit in front of the doors. The room corresponding to the core room on the other side of the middle pair of cupolas is used for molding sand storage, both the core sand and molding sand being shoveled through doors directly from the cars standing on a track running close alongside the building.

The wash rooms and locker rooms are located at the two ends of the building. Every provision has been made for the men in the way of separate expanded metal lockers for each workman, enamelled wash basins and shower baths, water closets and urinals. The shower baths, closets and urinals are partitioned off from the rest of the room so that no odors escape. The rooms are well lighted and heated and are clean and comfortable.

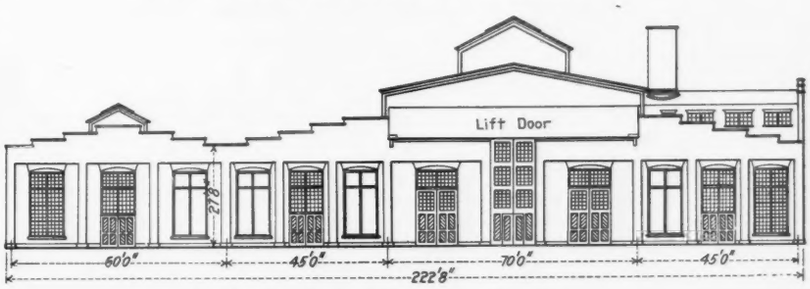
The coke and iron storage yard is along the east side of the foundry between it and the gray-iron foundry. The coke wharf is 24 ft. x 108 ft., with nine pockets on each side. Room has been left for extension 108 ft. long to be built when needed. A narrow gage track runs along under the pockets for loading the charging cars and turnouts from this track lead through each of the three scale houses located opposite the cupolas. Scrap and pig is piled in the space to the west of this industrial track, and can be loaded on the charging cars from either side of the pile. The scale houses are frame buildings covering the track scales and the charge is all weighed in the cars before being delivered to the charging floor. A wheel breaker is provided for each pair of cupolas located alongside of the scale house. It consists of a cupped anvil and a heavy drop weight raised by a hydraulic hoist.

A complete system of heating and ventilating the foundry building was installed by the B. F. Sturtevant Co., Hyde Park, Mass. The installation consists of two 10-ft. fans driven by motors which draw in air from the outside over exhaust steam heater coils and force it out through sheet-iron ducts to all parts of the building. The ducts are carried overhead on the roof trusses and the outlets are carried down the supporting columns delivering the warm air near the floor level. This arrangement has the advantage of high efficiency from a standpoint of heating and ventilation because the heated fresh air is delivered where most wanted and carries the smoke and gases up with it to the deck ventilators in the roof. One disadvantage, however, is that the warm dry air dries out the molding sand quickly and makes it difficult to keep the sand moist and in good condition.

The gray-iron foundry when completed will be used chiefly for making castings for car and locomotive repairs and new engines built at Juniata. It will be as complete in its equipment as the wheel foundry and as



Details of Core Ovens in Wheel Foundry.



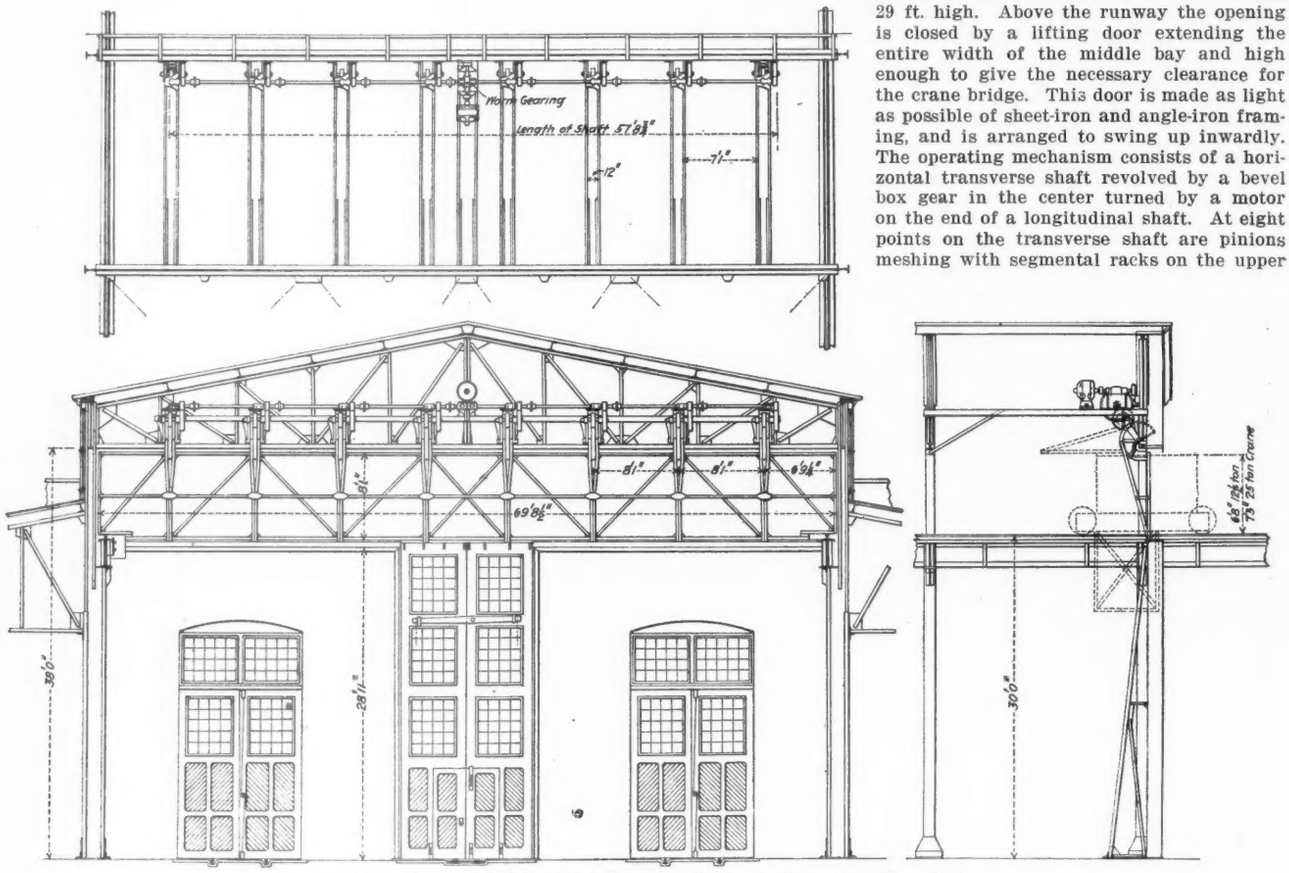
North Elevation of Gray Iron Foundry.

Part East and West Side Elevations of Gray Iron Foundry.

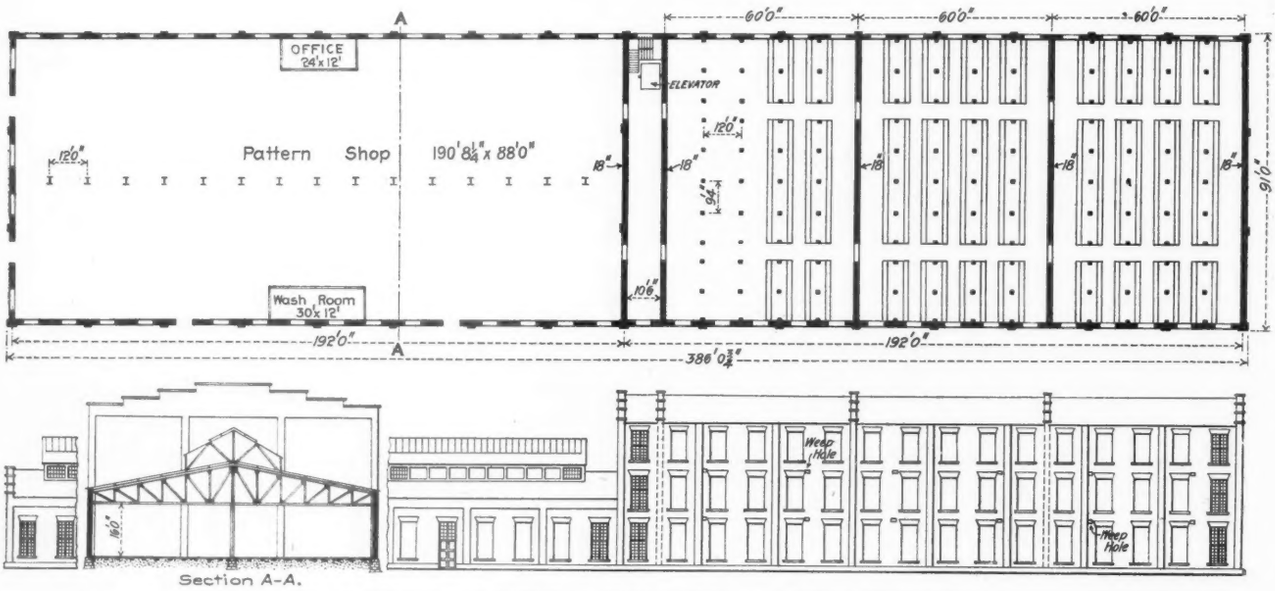
modern in every respect. The building, which is 564 ft. long by 162 ft. 8 in. wide, is divided into three longitudinal bays. Part of the west side bay will be taken up with three cupola rooms. The rooms near the ends of the foundry will contain two 96-in. cupolas having a capacity of 18 tons an hour each, and the middle room will contain a single Mackenzie cupola of smaller size for melting hard iron for cylinder castings and similar work. Each cupola will have its separate blast outfit and the arrangement on the charging floors will be similar to that already described for the wheel foundry.

The core ovens will be in the east bay, and the core room will be immediately behind them in a lean-to addition containing also a sand mixing room and wash room. Sand storage pits will be under the core room, and a conveyor system will be installed for filling them from the dumping pits under the unloading track outside the building.

The central bay of the foundry will be spanned by a 25-ton traveling crane and two other 5-ton cranes for lighter work. Traveling cranes will also be installed in the side bays and movable post cranes to be attached to the roof columns will be supplied. Outside of the building at each end is a flask storage yard and loading tracks, and these yards will have crane runways 280 ft. long continuing out from the crane runway of the middle bay of the foundry. The ends of the building are arranged to open to permit the 25-ton crane to run in or out, carrying flasks or heavy castings to be loaded on cars. The door operating device, which has also been used in the Altoona and Juniata shops, is shown in one of the drawings. The brick end wall, which extends up to the level of the crane runway, is cut out for a double door 12 ft. wide and 29 ft. high. Above the runway the opening is closed by a lifting door extending the entire width of the middle bay and high enough to give the necessary clearance for the crane bridge. This door is made as light as possible of sheet-iron and angle-iron framing, and is arranged to swing up inwardly. The operating mechanism consists of a horizontal transverse shaft revolved by a bevel box gear in the center turned by a motor on the end of a longitudinal shaft. At eight points on the transverse shaft are pinions meshing with segmental racks on the upper



Plan and Elevations of Lifting End Door for Crane in Gray Iron Foundry.



Plan, Elevations and Section of Pattern Shop and Pattern Storehouse.

end of the vertical door frames. The door is hung on a shaft passing through the centers of the segmental racks, and as the transverse shaft is turned the door is swung up inwardly. This has been found to be a simple and satisfactory door in every way.

The lighting of the gray-iron foundry is as excellent as that in the wheel foundry, as is evidenced by the amount of glass shown in the elevation drawings. The ventilation system will be very similar to that in the adjoining building with the exception that the main ducts from the ventilating fans will be laid in the foundations under the floor with openings up through the walls. There will be three sets of fans and heaters.

The cleaning floor is at the north end of the foundry in the middle bay. The castings will be cleaned on iron gratings over a pit under the floor, and the burnt sand dropping into the pit will be loaded on to small cars and carried out through a tunnel which emerges just beyond the end of the building. The narrow gage track in the tunnel continues on to a loading platform at the north end of the company's grounds, where the burnt sand will be loaded on to cars.

The power house, 89 ft. x 160 ft. 8½ in., is located south of the wheel foundry. In the boiler room are eight Babcock & Wilcox water tube boilers of 300 h.p. each, equipped with Roney stokers. The engine room contains two Wetherill-Corliss, horizontal cross-compound, direct-current units of 300 k.w. each, and two similar units of 500 k.w. each. They supply current for power and lighting at 250 volts. In addition there are two cross-compound, two-stage Franklin air compressors for the pneumatic hoists and chipping tools, a high-pressure hydraulic pump and accumulator for working the cupola elevators and wheel breakers, and a 50 k.w. direct-connected high-speed engine and generator for lighting purposes when the large units are shut down. The west end of the building is a temporary wall so that if desired the size of the plant can be enlarged by building on an addition and installing more boilers or generator units. A 5-ton traveling crane spans the engine room.

The pattern shop and pattern storage house are south of the gray-iron foundry and well away from the other buildings. The pattern shop is one-story high, 91 ft. x 193 ft., and the storehouse is the same width, but 180 ft. long and three stories high. The two are separated by a 12-ft. hallway on the lower floor, and in this hallway are the elevator and stairways, which are the only means of reaching the store rooms above. Each floor is divided into three rooms connected by fireproof doors, which are always kept closed. Automatic sprinklers are to be put in the rooms, and to prevent overweighting the floor in case a room is flooded, weep holes are cut in the side walls on each floor. The system of storing patterns and keeping records has no features of special interest.

At the present time the wheel foundry is running at half its capacity, or 450 wheels a day. All weights of 33-in. wheels for freight service are being made, and also a number of 36-in. wheels for passenger service. About 60 molders and helpers are at work. The gray-iron foundry and pattern shop will be in use by the summer.

We are indebted to Mr. A. W. Gibbs, General Superintendent of Motive Power, for the information and drawings from which this description was prepared.

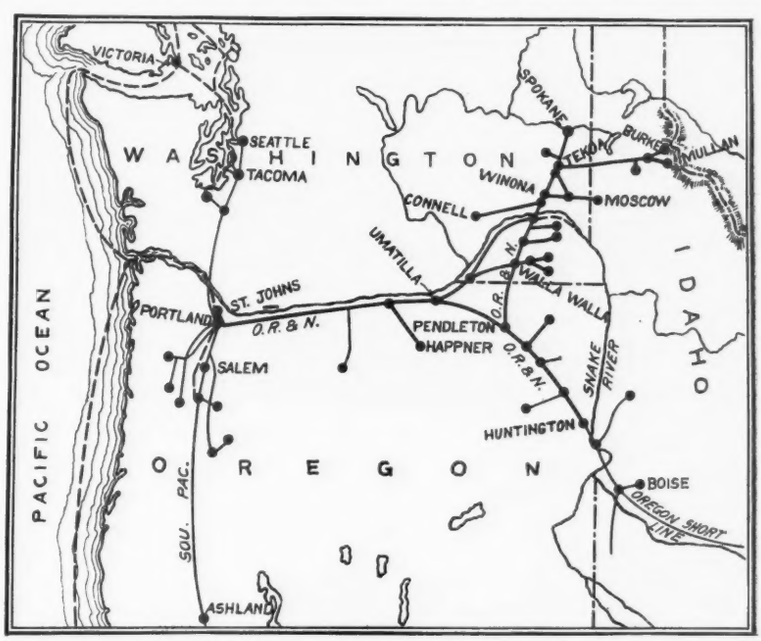
To guard against accidents on the Levens viaduct, in Westmoreland, England, the Furness Company has erected an ingenious automatic signaling apparatus. It consists of a combined wind pressure gage and recorder, and is connected with an electric arrangement by means of which bells are set ringing in distant signal cabins. These bells continue to ring so long as the velocity of the wind on the viaduct is dangerous to passing trains, and all traffic is stopped. A mail train was blown over on this viaduct during a gale in February, 1903.

Rebuilding the O. R. & N.

A brief statement of the work which was being undertaken on the lines of the Oregon Railroad & Navigation Co., together with full construction data for the year ended June 30, 1904, was printed in the *Railroad Gazette*, Dec. 2, 1904. The accompanying views show graphically the task which Mr. Harriman has set about to accomplish in making the Union Pacific system a route of low grades and easy curves. In a speech made at San Francisco, in 1902, Mr. Harriman said that when the Union Pacific emerged from bankruptcy, in 1898, and the present management took possession, they found a railroad incapable of doing the business which was tributary to it. In approximately two years and a half, grades were reduced from a maximum of 90 ft. to a maximum of 43.3 ft., and curvature was reduced from a maximum of 10 deg. to a maximum of 4 deg., except for a single short 6 deg. curve. He added that he had built 158 miles of railroad and had thrown away 188 miles.

An analysis of the value of this improvement work, as estimated by Mr. J. B. Berry, Chief Engineer, was printed in the *Railroad Gazette* March 25, 1904, with particular reference to the work on the Wyoming division between Cheyenne and Ogden, 516 miles. Here the mileage was reduced 30 miles by building 167. The maximum eastbound gradient was reduced to 43.3 ft., where before it had been as high as 97.7 on the stretch between Cheyenne and Laramie, and the maximum westbound gradient was reduced to the same between Laramie and Evanston, where the maximum grade had previously been 67.6 ft., making a total decrease in rise and fall of 632 ft.

The work on the Oregon Railroad & Navigation lines began slightly later than the other improvement work. It will be recalled that the Union Pacific lines in Oregon and Washington, extending across into Idaho eastward from the Spokane branch, are operated under the name of the Oregon Railroad & Navigation Company, as is shown in the accompanying map. This part of the system, including water lines on the coast and comprising a consolidation of the Oregon Steamship Company, the Oregon Steam Navigation Company and the companies owning the railroads built to overcome the rapids of the Columbia river, was leased for 99 years from Jan. 1, 1887, to the Oregon Short Line Railway Company, and the lease was transferred to its successor, the Oregon Short Line & Utah Northern Railway Company in 1889, with rental guaranteed by the Union Pacific Company. In default of interest, the property was taken out of the Union Pacific system and turned over to a separate receiver in 1894. It was then reorganized under the name of the Oregon Railroad & Navigation Company (the old company having been known as the Oregon Railway & Navigation Company), following a foreclosure sale in July, 1896, at which time the Oregon Short Line secured a majority of the common stock while a controlling interest in the preferred stock was held by the Northern Pacific, Great Northern and Union Pacific. Since that time, by increase of purchased interest, the Union Pacific has practically absorbed the company. A systematic plan of changing the line by reducing the curvature and grades and filling wooden structures with earth or replacing with steel has been followed during the last three years. The betterment and new equipment expenditures since the acquisition of the property by the present owners have amounted to $6,005,034, of which the greater part was charged income.



Map of the Oregon Railroad & Navigation Lines.

During the last two years, 306 bridges have been filled entire or thrown out by change of line, and 91 bridges have been shortened by the filling of ends. The aggregate length of bridges eliminated is 46,300 ft., or 8.77 miles, and the material used in filling bridges has amounted to 1,612,602 cu. yds. There was placed for drainage under 175 filled bridges, 9,840 lineal ft. of cast-iron pipe, weighing 1,248 tons. There was placed for drainage under six filled bridges 706 lineal ft. of arch culverts, requiring 1,361 cu. yds. of concrete masonry. One drainage tunnel, 3 ft. x 4 ft. diameter, 36 ft. long, was built under one bridge, and two tunnels for

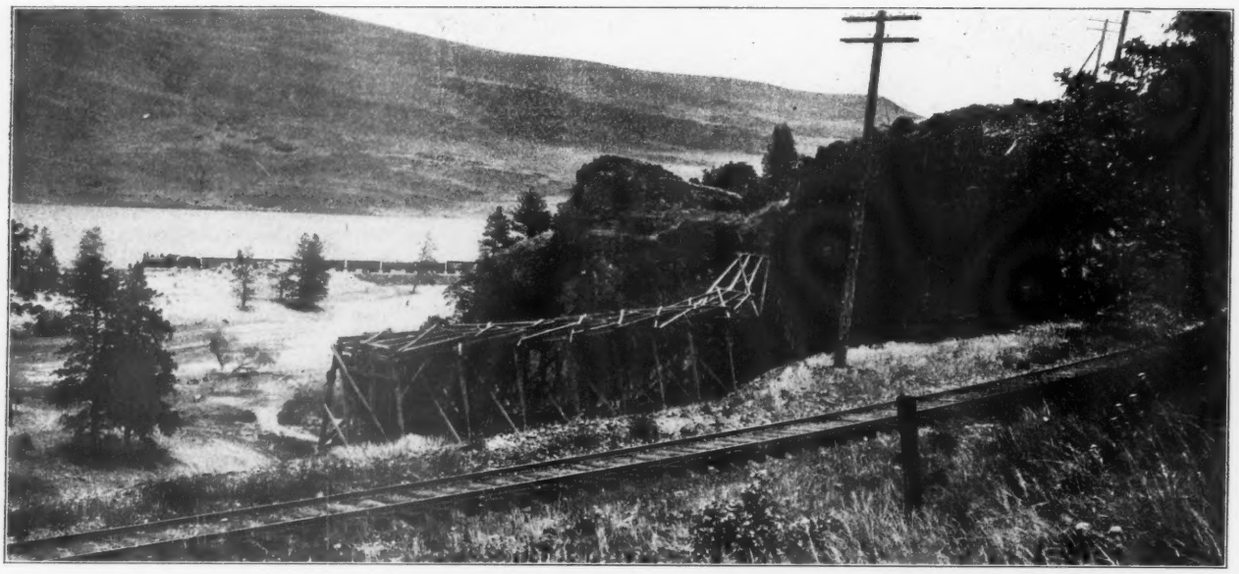


Fig. 1*—Two Successive Improvements. New Line Shown in the Distance.

Fig. 2—Change of Line 1,000 ft. Long, Eliminating 23 Degrees of Curvature.

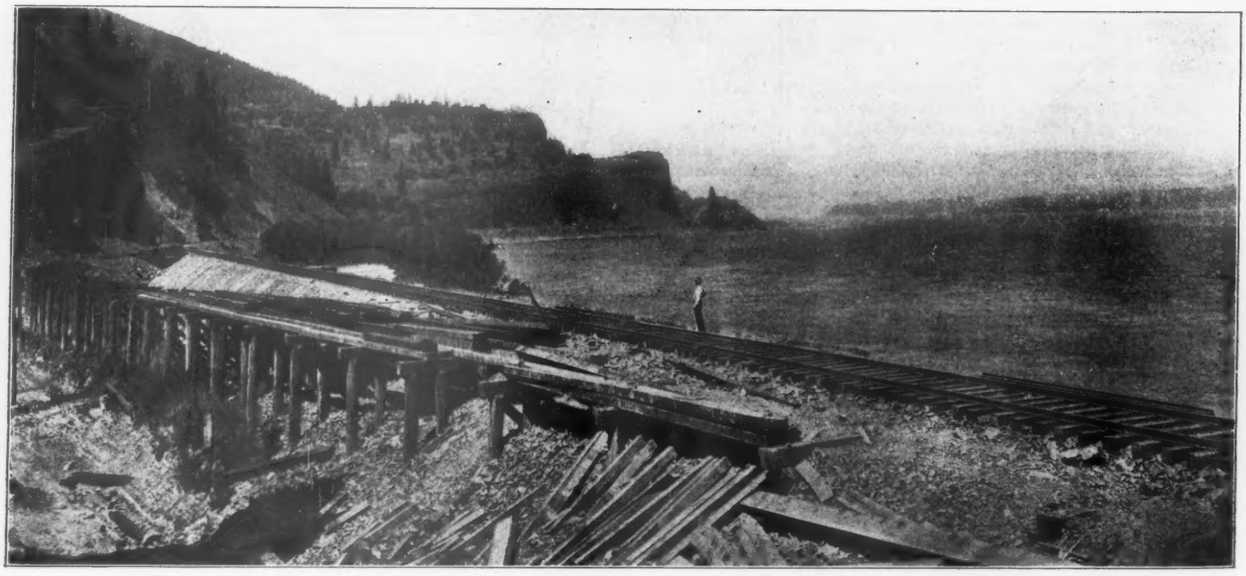


Fig. 3—Change of Line Taking Out Five Sharp Curves.

*These six pictures illustrate the article, Rebuilding the Oregon Railroad & Navigation Lines.

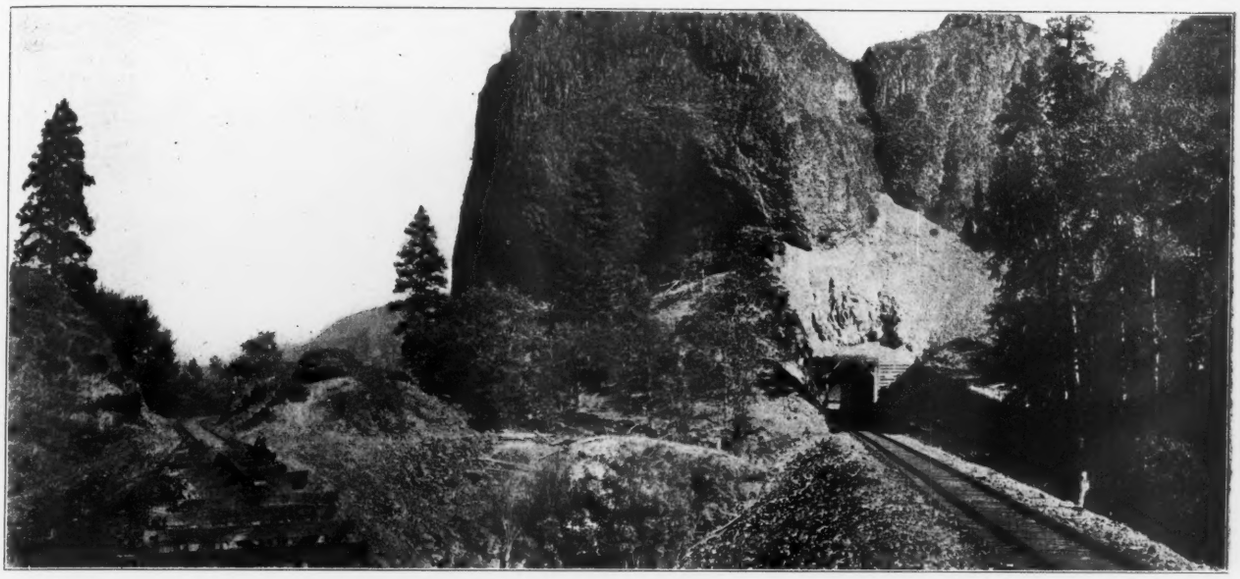


Fig. 4—Change of Line Eliminating 101 Degrees of Curvature.

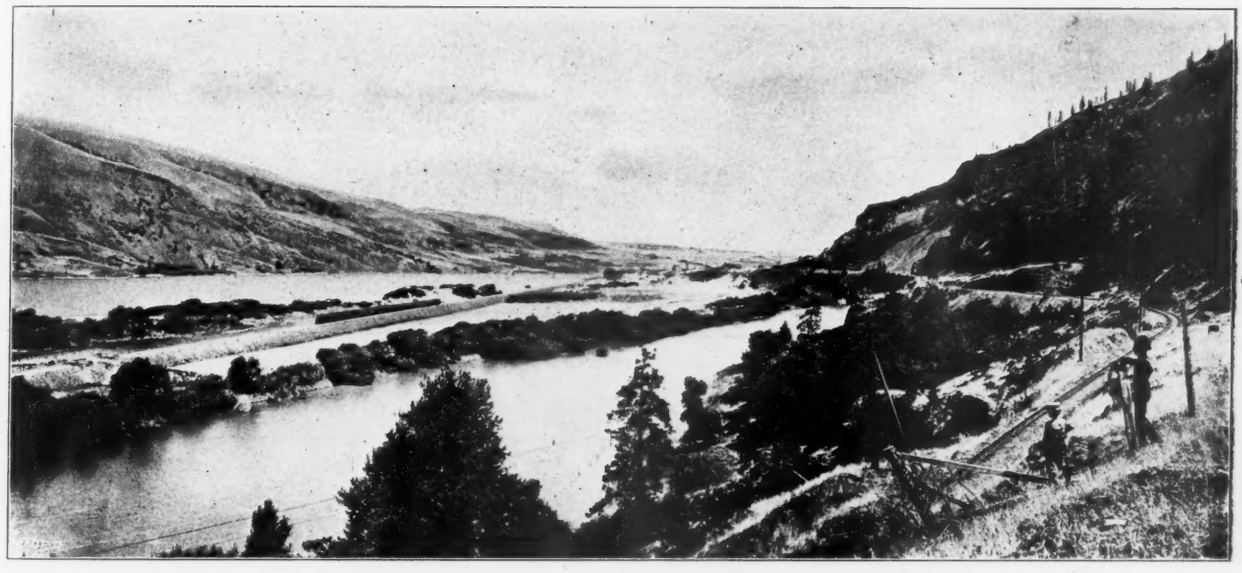


Fig. 5—View on Rowena Change of Line, 7 Miles Long.

Fig. 6—Change of Line Eliminating 95 Degrees of Curvature.

drainage 8 ft. x 8 ft. in diameter of aggregate length of 364 ft.

Twenty-nine steel bridges were erected, with aggregate length of 2,814 ft. In the abutments of these 14,663 cu. yds. of concrete masonry were used, and 2,023 tons of metal were used in superstructure.

During these two years, 26 separate changes of line were made, as shown in the accompanying table.

Name of change.	Original line, length, miles.	Distance shortened, miles.	Curvature, No. curves eliminated.	Eliminated degrees.
Latourelle	0.57	0.02	3	47
Bridal Veil	.60	.01	2	62
Eagle Creek extension	.53	.01	0	29
Hermann Creek	2.57	.07	12	384
M. P. 49 to 51	1.47	.01	10	155
Wyeth	3.56	.02	14	337
Shell Rock	2.96	.12	16	599
Viento	1.57	.06	3	123
Viento to Hood River	5.77	.09	17	510
Bridge 113	.38	.00	0	24
Bridge 114	.30	.00	0	21
Bridge 117	.30	.00	0	44
No. 2 at new tunnel	5.67	.19	37	859
Mosier	.80	.01	3	85
Bridge 141	.32	.01	2	53
No. 3 near tunnel No. 2	.23	.01	0	29
No. 4 near tunnel No. 3	2.31	.16	8	410
No. 5 at Rowena	7.15	.19	28	903
Mill Creek	.80	.02	2	111
Big Cut	.60	.01	2	97
Blalocks	.26	.00	1	35
Heppner Junction	.57	.00	1	36
Nos. 6, 7, & 8, Echo-Yoakum	7.26	.29	24	806
Wallula	.65	.04	1	93
Prescott to Highland	1.67	.00	0	32
Canyon	.60	.00	0	11
Totals	49.57	1.34	186	5,891

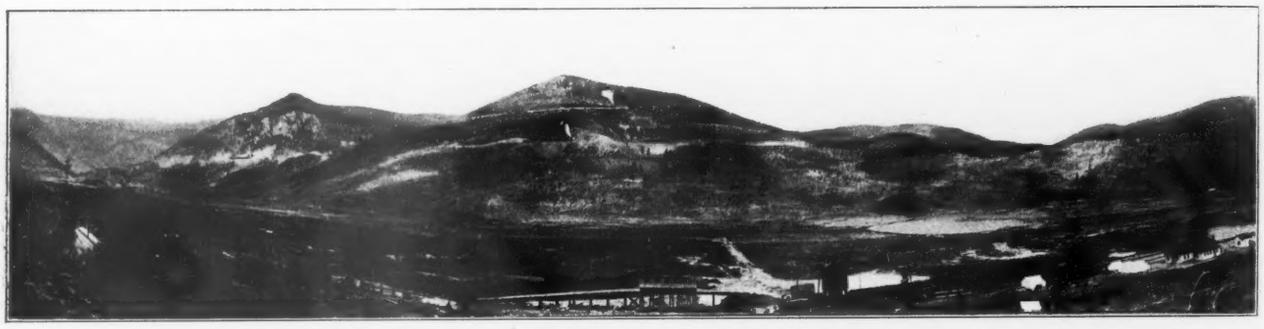
The grade changes reduced the ruling grade from the equivalent of 48 ft. per mile to 26 ft. per mile, and the maximum curvature, formerly 10 deg., was reduced to 6 deg. In all, 50 miles of the original line were changed, and the distance was reduced 1⅓ miles. The number of curves thrown out was 186, and a total of 5,891 deg. of curvature, equal to over 16¼ complete circles, were taken out.

The Denver, Northwestern & Pacific Road.

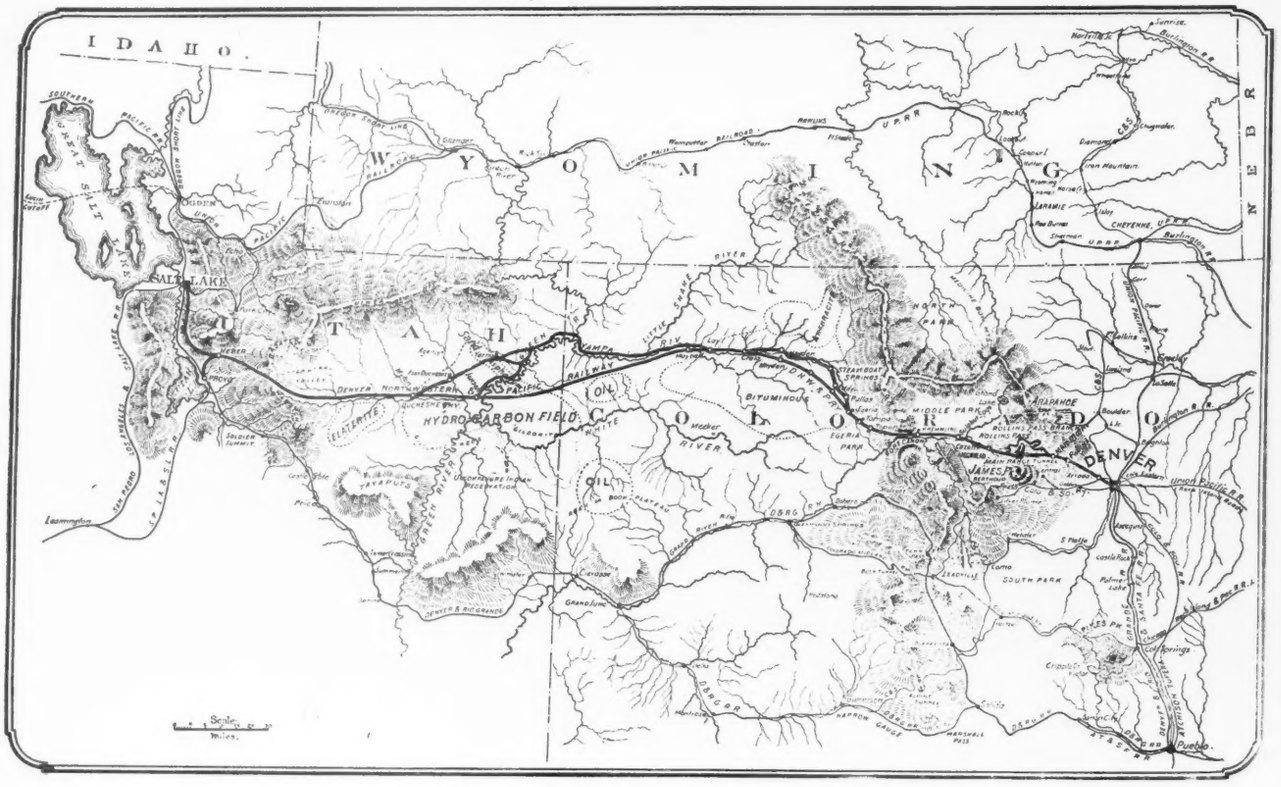
The Denver, Northwestern & Pacific differs in at least two important respects from other Rocky Mountain lines: (1) It more nearly illustrates the familiar definition of a straight line—the shortest distance between two given points; and (2) unlike the others, it should gain rich traffic from every section operated, for there will be no "dead haul" through stretches of desert country or barren, rocky regions. Every mile will be tributary to vast undeveloped mineral wealth and large areas of fruit and farming lands.

Some idea of the region traversed by this new railroad, a fair-sized part of which had already been completed, may be gained by an inspection of the accompanying map. The projected route, westerly from Denver to Salt Lake, lies midway between the Union Pacific, in southern Wyoming, on the north, and the Denver & Rio Grande on the south, and practically bisects lengthwise a virgin territory 200 miles wide by 500 miles long, comprising the northwestern part of Colorado and the northeastern part of Utah—a territory exceeding in area the entire State of Pennsylvania.

It is a somewhat singular fact that the route of the Denver, Northwestern & Pacific is practically identical with that set forth in a report to the president and directors of the Union Pacific by a civil engineer (A. N. Rogers) in March, 1867—nearly 38 years ago. Among other superior advantages of this route enumerated by Rogers was "its relative position to the Middle Park, and the remarkably favorable opportunity of tunneling the range." He further showed in de-



View from Tolland, Colo., Showing Three Tracks Above Boulder Park and Five Trains Climbing to Continental Divide.



General Map of the Denver, Northwestern & Pacific.

Nearing the Top of the Continental Divide. Elevation 11,300 Ft.

Tunnel Number Six.

tail the entire feasibility of a practically direct route from Denver through Middle Park, the Gore Range, and down the Yampa or Bear River valley to Utah, and contended that in northwestern Colorado the single circumstance of the line passing with the drainage for the whole distance was "a sufficient guaranty of obtaining a favorable line and grade." Thus, more than a generation ago, the route of the present enterprise was discovered and advocated before the officers of the pioneer trans-continental railroad, but for some reason it was ignored by them, and remained unnoticed, or at least unused, until the present.

As already indicated, the Denver, Northwestern & Pacific was projected as a trunk line between Denver, Colo., and Salt Lake, Utah. The organization was perfected by David H. Moffat and associates in July, 1902. Surveys had already been begun in April, 1902, and construction was started in January, 1903, at Utah Junction, 3.2 miles from Denver. The main line strikes a little north of west of Denver for a distance of 25 miles, crosses Coal Creek on a steel trestle with concrete foundations, skirts northerly along the foot-hills for about five miles, swinging thence nearly due west up Boulder Canon, toward the main range.

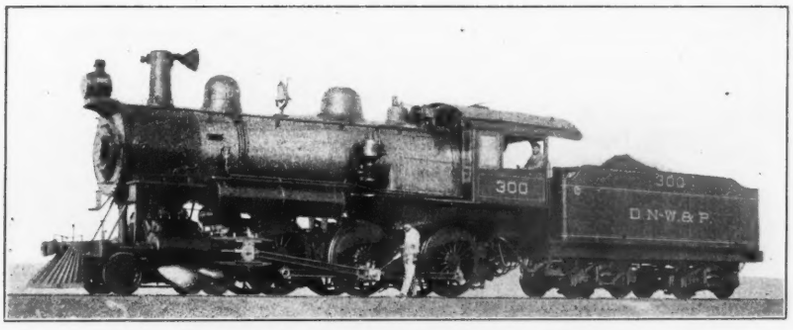
To advance the work as rapidly as possible, pending the construction of the main range tunnel, it was decided to build what is known as the Rollins Pass branch, from Boulder Park, about 50 miles from Utah Junction, over Rollins Pass, and down the western slope to a connection with the main line in Fraser River valley. Main range tunnel, which will carry the main line through the Continental Divide, lies about two miles north of James Peak. It is estimated that about two and a half years will be required to drive this tunnel. It is at an elevation of 9,930 ft. and will be about 2.6 miles long. While the Rollins Pass branch is at present a necessity as the connecting link between the parts of the road on either side of the Divide until the main range tunnel is completed, its closeness to Denver and unsurpassed scenic attractions are features which it is thought will draw a heavy tourist travel and warrant its permanent operation during each summer season.

The road is now completed and in operation a distance of 73 miles from Utah Junction to Arrowhead, a new town well down on the western slope. The maximum main line grade is 2 per cent., compensated on curves at the rate of .035 per degree, and from Leyden Junction, at the foot of the front range, to the east portal of the main range tunnel, a distance of 45 miles, the grade is nearly continuously 2 per cent. except for the easing up to 1 per cent. or less at sidings. From the west portal of main range tunnel there is a continuous descending grade of 2 per cent. compensated until the Fraser River valley is reached, the grade from thence westerly varying from 1.25 per cent. to considerably less than 1 per cent. The main line maximum curvature is 10 deg. Forty-two per cent. of the entire distance from Utah Junction to Hot Sulphur Springs, 97.28 miles, is curved line, giving an average of 132 deg. per mile. Curves of 2 deg. and over are spiraled; compound curves of over 1 deg difference in ratio are spiraled between curves; and a tangent of not less than 60 ft. is laid between ends of spirals where curves are in opposite directions. For 17 miles out of Utah Junction nothing sharper than 3 deg. is used, and curvature is restricted to a maximum of 4 deg. in the valley of the South Boulder river near Rollinsville. The track is elevated by Searles' rules, allowing for a speed of 30 m.p.h. for passenger trains on 10-deg. curves. Vertical curves are laid when there is a difference of .4 per cent. in grade rates.

The widths of roadway are 20 and 22 ft. in cuts of solid rock and earth respectively, and fills are 18 and 16 ft. Rock excavation slopes vary from 1¼ to 1 to ¾ to 1. Slopes in loose rock excavation are ¾ to 1 and in earth excavation 1 to 1. Slopes for earth and rock fills are 1½ and 1¼ to 1, respectively. The main line has numerous heavy cuts and fills, the heaviest excavations being in rock, and many of them have an upper-side cut of 100 to 125 ft., with yardage running from 30,000 to 40,000 cu. yds. Quartz Creek, about 29 miles out, was first crossed on a temporary trestle 95 ft. high. This has since been filled, requiring 130,000 cu. yds. of material.

Between Utah Junction and Arrowhead the line as built includes about 50 miles of main line and 23 miles of branch line over Rollins Pass. The grading in earth amounted to only about 8 per cent., 35 per cent. being loose rock, and 57 per cent. solid rock. Ditches in cuts are 4½ ft. wide on top, with bottom 1 ft. below sub-grade. For a distance of 23 miles west of Utah Junction the track is ballasted with slag from Denver smelters. The remainder of the line through to Arrowhead is ballasted with disintegrated granite and gravel. The ballast is 10 in. deep under ties, and extends 18 in. beyond their ends.

Sixteen-Deg. Curve Around Yankee Doodle Lake. Elevation 11,400 Ft.



Passenger Locomotive with Smoke Deflector.

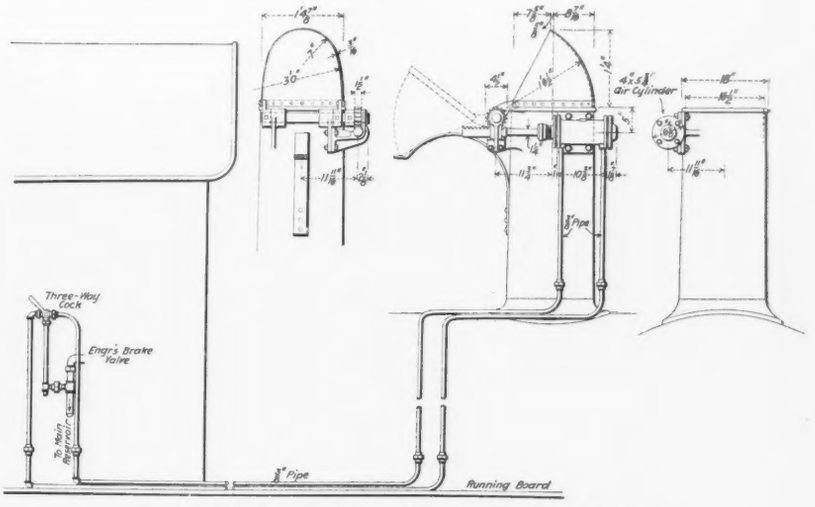
Ties are all Texas long-leaf pine, 85 per cent. heart, 6 in. x 6 in. x 8 ft. The rails are 80 lb. Am. Soc. C. E. section, laid on southern pine ties, 3,360 to the mile, with tie plates on each tie. Under fills of 15 ft. and less, on prairie section, double-strength vitrified pipe is used; fills higher than this have box culverts of dry-laid rock rubble. On the mountain section similar box culverts and also some cast-iron pipe, are used.

In the stretch of 13 miles of line along the foot-hills fronting the plains, and up the South Boulder Canon, the alternative was presented of building high viaducts and excavating heavy cuts, or of seeking a higher level, thereby avoiding to as great an extent as possible trestle work, substituting tunnels therefor. The high line was chosen as giving better alinement and a safer and more permanent roadbed. This necessitated the driving of 30 tunnels, ranging from 73 ft. to 1,729 ft. in length, and aggregating 16,000 ft. The normal section of tunnel excavation on tangent is 16 ft. wide and 24 ft. high, or 22 ft. above top of rail. The width was increased on curves as requirements demanded, reaching 17.5 ft. for a 10-deg. curve. The tunnel excavations were to a large extent in solid rock, but in numerous cases seams made it advisable to insert timber lining. In nearly all cases 12 in. x 12 in. timber was used.

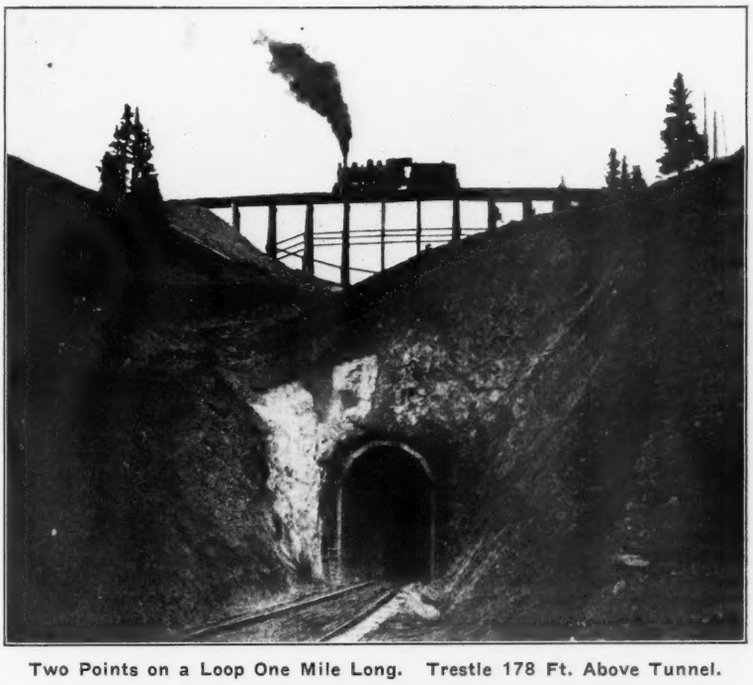
Very few small bridges were required, considering the character of the country. Coal Creek is crossed by a steel trestle consisting of three 64-ft. and two 32-ft. deck girder spans. There are 45 temporary timber trestles on the main line east of Rollins Pass branch junction. These are to be filled. The highest of these trestles is 81 ft. at the crossing of Bull Gulch, about 25 miles out of Utah Junction.

The Rollins Pass branch, as already explained, was built to reach Middle Park and the country beyond without waiting for the construction of the main range tunnel. Its maximum grade is 4 per cent., compensated .035 per degree on curves, and the line is for the most part laid up to the maximum on both east and west slopes. For about 3,000 ft. across the summit the grade is practically level. Curves for this line are laid with a 16-deg. maximum, but the topography of the country is such that few of this curvature were required. Curves of 2 deg. and over are spiraled. The roadbed of this branch is 16 ft. wide in cuts and 14 ft. on fills, and something over a mile of the line has been snowshedded. The same track construction is used on the branch as on the main line. The altitude of Rollins Pass is 11,660 ft., and the scenic features while crossing the range are unexcelled.

One of the 16-deg. curves is shown circling Yankee Doodle Lake. At the near side of the lake, a little to the right, may be seen a part of the dump from a tunnel begun in 1881 by a man named Pratt who afterward sold it to the Denver, Utah & Pacific—a project of the Burlington's. The tunnel was driven only 40 ft. and then discontinued, all hope of ever building a railroad on the route projected having been abandoned. The lake derived its name from the musical tendency of one of the workmen engaged on the tunnel, who was constantly whistling "Yankee Doodle." There is a belief among the older inhabitants of the section that the lake is bottomless, claiming in confirmation that it was impossible to make any headway with the fill across it from the tunnel mouth, as originally intended, the material disappearing as rapidly as dumped. The lake probably occupies the crater of an extinct volcano.



Smoke Deflector for Locomotive Stack, D., N. W. & P.



Two Points on a Loop One Mile Long. Trestle 178 Ft. Above Tunnel.

After crossing the main range west of Denver the line will traverse the Grand River valley through Middle Park, 45 miles; the Yampa (or Bear) River valley, 153 miles, through the vast bituminous and anthracite coal fields of northwestern Colorado; the valleys of the Green River and its tributary, the Duchesne, through the famous hydro-carbon fields of northeastern Utah, 160 miles; and thence over the Wasatch Range into Salt Lake valley.

Although the Denver, Northwestern & Pacific may properly be considered a mountain line, its adaptability of route through the valleys of northwestern Colorado and northeastern Utah, which all run in the direction desired, permit the obtaining of a direct route with comparatively light grades and curves, which should enable the road to handle a large tonnage at relatively low cost.

The contractors for the construction so

far as completed are Orman & Crook, of Denver; Geo. S. Good & Co., of Pennsylvania, and Streeter & Lusk, of Colorado. Contracts have been let and active construction is in progress from the present terminus of the Rollins Pass branch at Arrowhead to Hot Sulphur Springs, the county seat of Grand County, Colo.

Mr. H. A. Sumner, Chief Engineer of the "Moffat Road," has had a good many years of experience in the location and construction of difficult railroad work in the mountainous regions of the West. His chief assistants are Mr. L. D. Blauvelt, Resident Engineer in charge of the work east of the summit of the Continental Divide; Mr. E. A. Meredith, Resident Engineer for the work on the slope west of the summit, and Mr. H. L. Aulls, office engineer.

The mechanical department of the road was carefully organized as soon as the purchase of equipment became necessary, and it has been from the outset the policy to buy only first class equipment, modern in every particular and as nearly suited to the prospective needs of the road as could be estimated in advance. For the freight equipment all parts of different classes of equipment are standardized and made interchangeable wherever possible. The advantage of starting a new road on this basis is obvious and in this case has already proven profitable in the small number of repair parts it is found necessary to carry in stock.

All locomotives are equipped with Westinghouse combined automatic and straight air-brakes, and the large passenger and freight locomotives have very large main reservoirs and two 9½-in. pumps each. They are also equipped with the water brake. Four additional locomotives have recently been ordered.

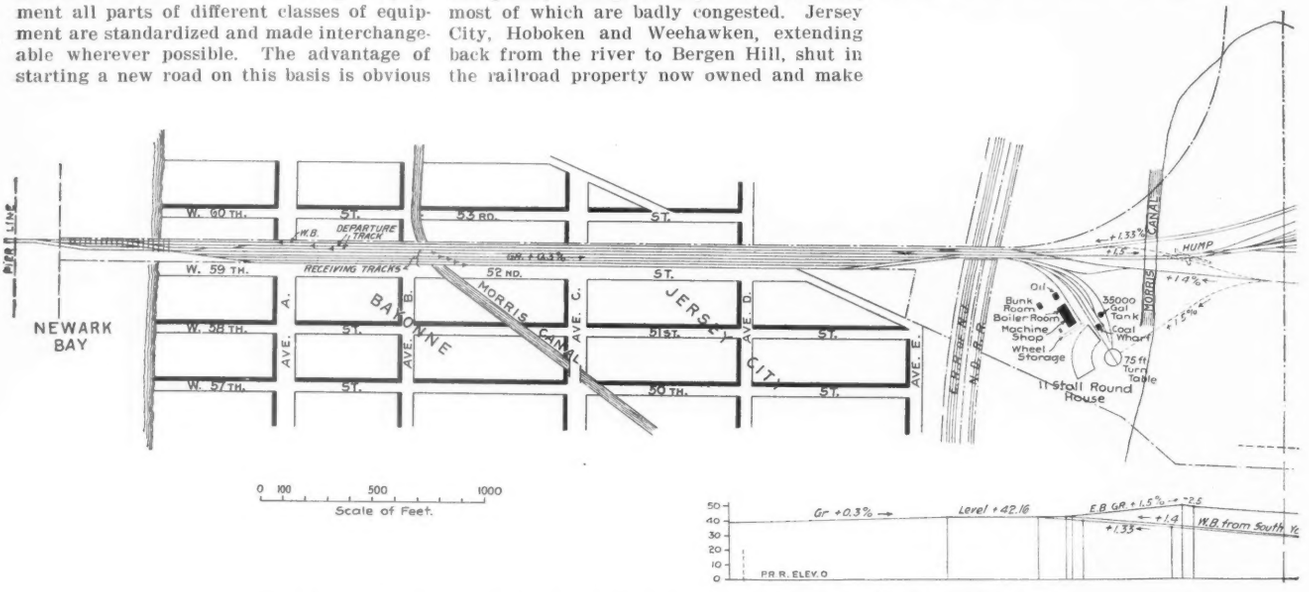
The illustrations contain a view of one of the road's 10-wheel passenger locomotives, having 20 in. x 28 in. cylinders and 137,500 lbs. on drivers. The device attached to the stack is a smoke deflector, details of which are shown. It is air operated and is controlled by the engineman with a three-way cock in the cab. On entering a tunnel the bonnet is thrown forward as indicated by the full lines. On emerging therefrom it is dropped back to the position seen in the photograph. When the bonnet is in working position it causes the smoke to strike the roof of the tunnel at an angle sufficiently obtuse to produce a tendency to trail along the roof and descend back of the cab. The use of the deflector has greatly diminished the enginemen's trouble with gases and smoke, and by the use of an electric headlight a very fair view ahead is obtained. The steaming of the engine is but little impaired when the bonnet is in use.

The Pennsylvania Freight Terminals in New York.

The problem of providing suitable freight terminals in New York is an exceedingly difficult one which all of the railroads entering the port are trying to solve. Practically all of the freight received or delivered must be lightered or carried around the harbor on car floats to the various docks and piers, and added to this is the difficulty of obtaining the required space on the water front for piers. The New York Central is the only road having freight terminals on Manhattan Island, and with the exception of the Long Island and the New York, New Haven & Hartford, all of the other roads have their terminals on the Jersey shore of the North river and the Upper Bay. The length of water front available is limited and is now almost entirely pre-empted so that none of the roads can greatly enlarge their present terminals, most of which are badly congested. Jersey City, Hoboken and Weehawken, extending back from the river to Bergen Hill, shut in the railroad property now owned and make the acquisition of more land almost out of the question. The Pennsylvania, like the Erie, the Lackawanna, and the West Shore, was seriously hampered by these conditions, and in planning for the enlargement of its terminal facilities abandoned the idea of making improvements to its Jersey City water front yards and docks. Instead, plans were made for a new yard on the shore of the Upper Bay, some 3½ miles south of the present station in Jersey City, extending out from the narrow neck of land separating Newark Bay and New York Bay. This new yard was to be connected by a double-track freight road with the main line at Waverly, N. J., about three miles beyond Newark. This plan was first proposed as far back as 1890, before the Manhattan Island passenger terminal scheme, which involved the partial abandonment of the Jersey City station and the enlargement of the adjacent freight terminals, took definite shape. About four years ago the work of filling in the mud flats along the shore for this new yard was begun and this has been so far completed that the north group of tracks is now in use in connection with the transfer bridges which have been built. The new yard is known as the Greenville yard, and when entirely completed will be the largest tidewater terminal in this country.

The Greenville yard and Waverly connection will form only a part of the general scheme proposed for handling the enormous and constantly increasing freight business of New York and vicinity. At Perth Amboy and South Amboy, N. J., the Pennsylvania has large coal storage and shipping yards and docks, where most of its tidewater coal is delivered. Before the Greenville yard was opened or the Newark track elevation begun, all freight trains for Jersey City and New York were run through Newark over the main line and into the Meadows yard located in the Hackensack meadows between Newark and Jersey City. Here it was classified and made up in switching trains to be taken in to the docks at Jersey City or delivered to other roads. The facilities at Jersey City consist of coal and lighterage piers, grain elevator and car ferry transfer bridges located north and south of the passenger station and connected by tracks on a heavy grade up to the elevated structure, which carries four tracks through the city. There is no classification yard or other similar facilities along the water front. Before the Newark track elevation was begun in 1900 a double-track freight line was built from the west end of the meadows yard across the west end of the Meadows yard across of Newark to connect with the main line east of Waverly, and all freight for Jersey City is now run over this line, thus diverting all but passenger traffic from the main line through Newark and Harrison.

A part of the general scheme which, however, has not yet been begun, is the building of an elevated freight road from Hamilton avenue in South Brooklyn, on the east shore of New York Bay, through Brooklyn and Long Island City, to a point opposite Ward's Island, and putting a bridge over Hell Gate, Randall and Ward's Islands to the main land in Westchester County, thus giving a physical connection from the New York, New Haven & Hartford to a point in Brooklyn almost directly across the bay from the new Greenville yard. The franchise for this road is now in the hands of the Board of Aldermen of New York, but has not yet been granted. If built it will permit all freight to and from New England points to be ferried or lightered across the Upper Bay from Greenville to Brooklyn in a part of the harbor not congested with traffic or greatly obstructed by ice, and made up in trains for delivery to the New Haven at its Oak Point



Receiving and Departure Tracks and Engine House at West End of Greenville Yard.

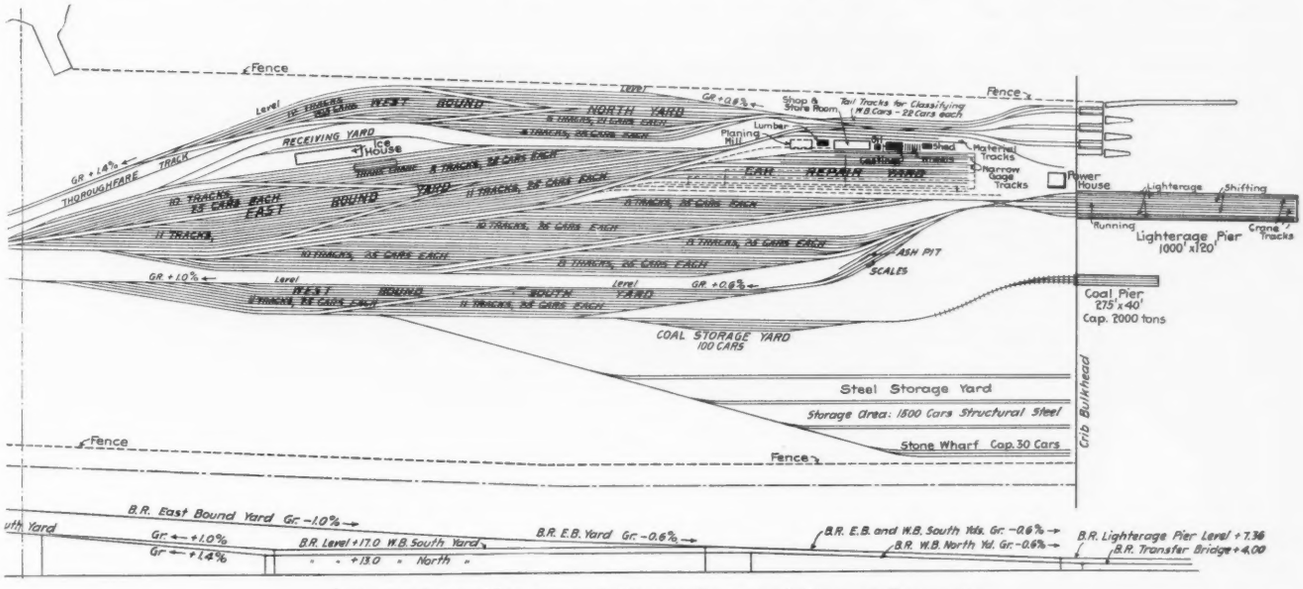
terminal in the Bronx. The Long Island Railroad would also be connected at Long Island City.

The most interesting part of this whole scheme of freight terminals is, of course, the Greenville yard, which will be made the main receiving and distributing point in and around New York. A short description with the layout of tracks was published in the *Railroad Gazette*, Feb. 5, 1904, but since that time the arrangement of the yard has been entirely changed. Because of the fact that the work is even now only partially completed the plan here shown may be changed somewhat in the future, but in its general features it shows the layout planned for the finished terminal.

The yard is built on made land and extends out from the shore line about 5,200 ft. The company acquired the rights to a tract of about 500 acres of submerged land running from the shore line out to the established pier head line, a distance of about 8,000 ft., and having a frontage of 1,900 ft. at the offshore end, widening out to 3,700 ft. frontage along the shore. This land was to grade, but the south half is still unfinished. In the center of the yard the mud bottom has been forced up in great ridges 20 ft. or 30 ft. above the level of the water by the pressure of the fill along the sides. Since the completion of the connecting road across Newark Bay to Waverly, construction trains have brought in dirt from various excavations in progress on other roads in the vicinity, and this is being used to bring the shore end of the yard up to the grade of the hump track.

The arrangement of the different east and westbound classification and storage yards laid out on the filled-in tract and the receiving and departure yards to the west is shown on the accompanying plan. It will be seen that there are three westbound departure tracks and five eastbound receiving tracks, each about 3,500 ft. long. The departure tracks are to the north and lead directly out on the westbound main track. The receiving tracks lead from a ladder at the end of the eastbound main track. Two short storage tracks holding seven cabooses each are in between the east and westbound of the south yard without crossing over the eastbound tracks.

The hump at the head of the eastbound yard carries two tracks and rises on a 1.5 per cent. grade for about 425 ft. to the "kicker," which is 50 ft. long on a 2.5 per cent. grade. A 1 per cent. grade is continued on down through the main group of the eastbound yard to give the cars a sharp run. Just beyond the "kicker" is a double cross-over between the two main ladder tracks so that either may be used in drilling cars over each of the hump tracks. It will be seen that each of the ladder tracks of the seven separate yards has a running track extending almost up to the head of the yard so that the cars will lose no headway in running over switches and frogs. This makes it possible to operate the entire yard from the hump in spite of its length. At the west end of the eastbound yard it divides itself, the south group of five yards having the tail tracks leading to the lighterage pier, and the north group of four yards connecting with the tail tracks of the transfer bridges. Thus the north group will be used



Layout of Classification and Storage Yards and Piers at Greenville.

from 5 ft. to 6 ft. under water, and the bottom was soft mud. Work was commenced about four years ago in filling in the area required for the yard, which is about 205 acres. More than 22,000,000 cu. yds. is the estimated amount which will be required to bring all parts of the yard up to the established elevations, which are 8 ft. at the bulkhead line and 47 ft. at the hump near the shore line.

Before beginning the filling in, two pile and crib work retaining walls, or fences, were built out from the shore, 1,700 ft. apart, and heavy riprap was deposited along the outside to hold the fill from spreading. Hydraulic and bucket dredges were used for much of the early part of the work, the excavation being taken largely from the 800-ft. channel which was dredged out to the main harbor channel. Cellar dirt from New York was dumped from scows, and much of the soil from the excavation of the Pennsylvania's passenger terminal on Manhattan Island has been wasted here. Some trouble was experienced with the north retaining wall, which broke out in places from the pressure exerted by the heavy filling dumped in on top of the soft mud bottom. Up to the present time more than three-fourths of the required material has been put in. All of the north side of the yard is filled almost up main, and incoming trains drop the caboose on entering the receiving yard. Westbound trains pick up a caboose after pulling out on the main track.

At the east end of the receiving and departure yard, the tracks narrow down to a four-track throat on the bridge over the Central Railroad of New Jersey. There is a double cross-over at this throat and three leads to the engine house, which is located on the high ground to the south of the tracks between the Morris canal and the Central Railroad.

The main yard opens out from the throat on a prevailing descending grade toward the bulkhead. It consists of three separate groups of yards; a long narrow group of three yards for westbound traffic on the north side of the tract, a similar group of two westbound yards on the south side, and a group of nine eastbound yards lying in the center between the westbound yards. Two of the tracks in the throat are for westbound traffic leading to the north yard with a single cross-over track to the south yard. The other two tracks lead up to the hump at the head of the eastbound group. A single connecting track is provided for which will lead from the end of the south yard under the hump and into the pull-out track of the north yard so that trains can be taken out for classifying cars to be run on the transfer floats and ferried around the harbor, while the south group will be used for cars to be unloaded on the lighterage pier, and for storing cars to be held for unloading. Cars loaded on the lighterage pier will be collected in the south westbound yard and cars received at the transfer bridges will be classified in the north westbound yard.

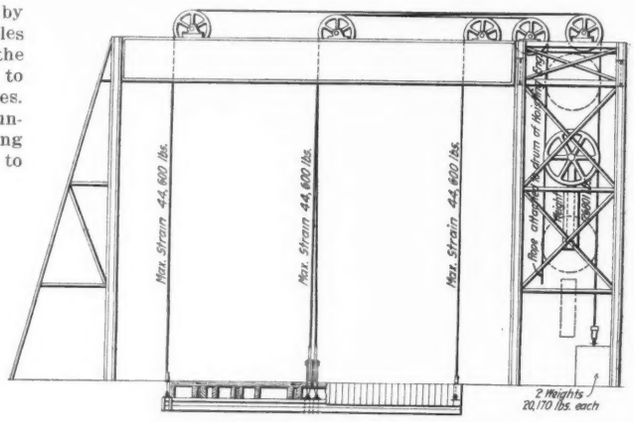
A thoroughfare track leads from the hump tracks just in front of the double cross-over around the eastbound yard along the south side of the north westbound yard to the tail tracks of the transfer bridges to provide for light engine movements and shipments of rush freight. The arrangements for re-icing refrigerator cars also provide for their quick despatch through the yard. An ice house, 50 ft. x 300 ft., will be built north of the eastbound yard, and a separate track leading entirely around the yard will give an unrestricted movement for cars to be iced. A double-track icing station with 1,100 ft. of track room will be built opposite the ice house so that as many as 25 cars can be iced at one time. The special track connects with the transfer bridges at the east end, and after re-icing, cars can be run directly on the floats for delivery to connections.

The car repair yard is located at the east end of the eastbound yard. Eleven stub

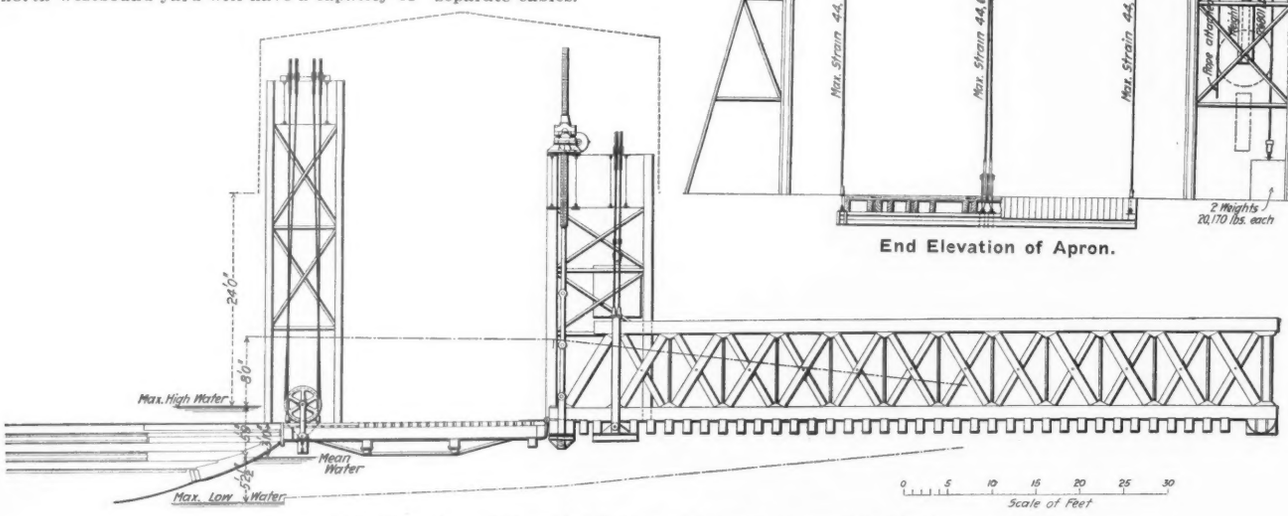
tracks leading from one ladder track will be provided for, although only nine will be put in for the present. Narrow-gage tracks for carrying material will be laid between each pair of tracks, and the planing mill, wheel storage tracks and store houses will be located along the north side. In addition to the yards already mentioned, there will be a coal storage yard holding 100 cars located between the end of the south westbound yard and the coal pier, which extends out from the bulkhead south of the lighterage pier. A storage yard for structural steel to hold 1,500 cars of material will be provided for in the southeast corner of the yard tract, and a stone wharf having three tracks with a capacity of 30 cars will be built along the south bulkhead at the outer end.

The eastbound yard as at present laid out will have a total capacity of 2,100 cars; the north westbound yard will have a capacity of 593 cars, and the south westbound yard will have a capacity of 550 cars, which gives a total westbound yard capacity of 1,193 cars. There is available space left for almost doubling this capacity in the future.

The transfer bridges at the end of the yard embody a number of new features of design. There are three of these bridges spaced 75 ft. center to center, and all are under one roof. The principal details of their design are shown in the accompanying drawings. The hinged bridge is raised and lowered mechanically and independently of the end it is hung from four rods 5 in. in diameter, the rods passing through bearing plates on the under side of each of the bottom chords of the four trusses. These rods are hinged in two places and at their upper ends are threaded to pass through the lifting nuts which are mounted on top of the 6-ft. plate girders spanning the opening over the bridge. The lifting nuts are turned through worm and screw gears mounted on a common horizontal shaft which is rotated by two motors. Part of the weight of the bridge is counterbalanced by weights hung from cables passing over sheaves on the cross-girders and attached to the top chords of the trusses. There are four of these counterweights, each weighing 51,888 lbs., and attached to separate cables.



End Elevation of Apron.

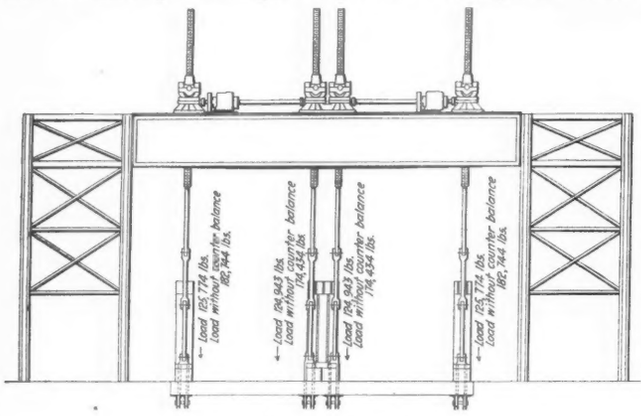


Side Elevation of Transfer Bridge and Apron, Greenville Yard.

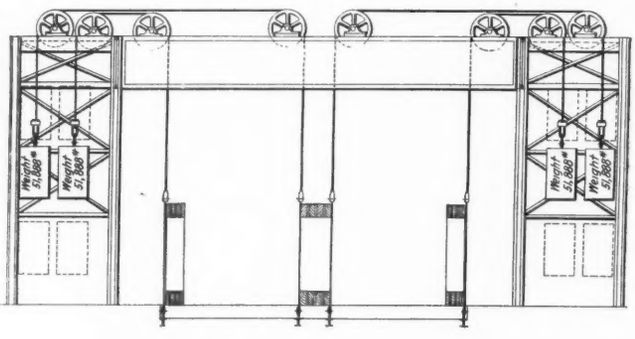
The apron is framed of wood and stiffened with truss rods. It is 32 ft. long and is strongly hinged at the back end to the bridge. At its outer end it is supported by eight cables running over sheaves on the cross-girder above. The two pairs of outside cables are attached to the frame of the apron, but the two pairs of middle cables run through sheaves attached to the outer end of the apron between the tracks. These cables pass down at one side of the bridge over a system of suspended and idler counterweights to the winding drum which raises and lowers the bridge to suit the stage of the water. The cab contains the controllers for the bridge and apron motors, the switchboard, circuit breakers and current meters.

Although the stage of the water at maximum low tide and maximum high tide varies only 11 ft., provision has been made in the operating mechanism for a maximum travel of the end of the bridge of 16 ft. 6 in. and 18 ft. at the end of the apron. The usual winches and locking bolts are provided for securing the car floats to the apron. A breakwater 600 ft. long has been built along the north side of the slips and the fenders are extended out 125 ft. from the end of the bridge house.

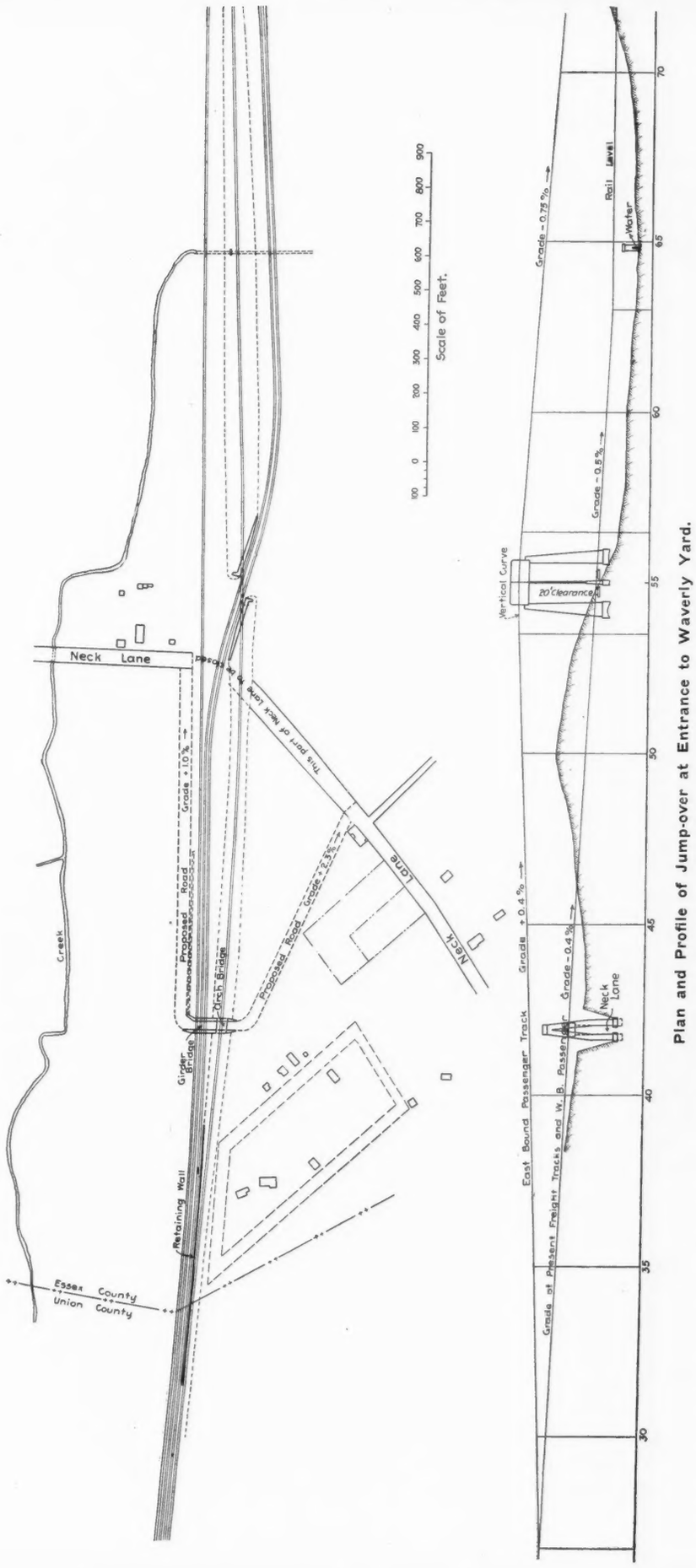
The lighterage pier is 200 ft. south of the transfer bridges. It is 1,000 ft. long and 120 ft. wide, and the base of rail is 7½ ft. above mean high water. Eight tracks are laid for its entire length, and in addition three crane runways for traveling jib cranes. This pier, as well as the three transfer bridges, is completed and in use. About 250 ft. south of it tide, the outer end being supported from the girders above and the rear end resting on a semi-circular rocker and buffer bearing. No pontoon is used for the bridge or apron. The bridge is a double-track, wood framed truss 41 ft. long over hinges. At its outer apron. This drum is operated by an electric motor controlled from a cab built about 20 ft. above the floor to one side of the opening of the bridge house. The operator from this cab has a clear view of the car float and the bridge and operates the apron and an elevated coal pier with pockets will be built for retail shipments of coal. This pier will be 375 ft. long by 45 ft. wide, and will have a capacity of 2,000 tons. If more storage capacity is needed in the future it can be extended out another 600 ft. Room is left


← Load 125,774 lbs. Load without counter balance 182,744 lbs.
← Load 126,943 lbs. Load without counter balance 174,434 lbs.
← Load 126,943 lbs. Load without counter balance 174,434 lbs.
← Load 125,774 lbs. Load without counter balance 182,744 lbs.

End Elevation of Bridge.



Cross Section Back of Hoisting Screws.



Plan and Profile of Jump-over at Entrance to Waverly Yard.

along the south end of the bulkhead for two more piers when they are needed. To protect all of these piers from ice and from the northeast storms a timber breakwater 2,800 ft. long has been built out from the bulkhead line to the established pier line beginning about 600 ft. north of the end of the bulkhead.

It will be seen from a study of the whole yard layout how provision has been made for handling each class of traffic in and out at both ends of the yard. The road engine movements are reduced to a minimum and do not interfere with the movements in the classification yards in any way. Yard engines can move freely from one group of tracks to another over the numerous thoroughfare and running tracks, and the grades have been adjusted as far as possible to give the greatest assistance to the car movements in each direction. Only a small part of the south side of the tract has been utilized in the present layout, and the remaining area is available at any time for more storage or classification yards as they may be required. The addition of these yards in the future would not affect the present arrangement seriously.

The connecting road from the end of the Greenville yard to the main line at Waverly, N. J., parallels the Lehigh Valley freight tracks for the entire distance just to the south of them. It begins at the west shore of Newark Bay, which is crossed on a pile and timber trestle about a mile long. The channel of Newark Bay is near the eastern shore and the Lehigh Valley crosses it with a double-track, center pier, through draw span. The Pennsylvania trestle is too close to that of the Lehigh Valley to allow a second swing span to be put in, and for the present the Pennsylvania has secured trackage rights over this bridge. The trestles are run together at the ends of the bridge and the Pennsylvania uses the south track for its trains, while the Lehigh Valley uses the north track. One track of each road is carried through as a gauntlet track. From the end of the trestle to Oak Island Junction, two miles, the track is new construction, but the two miles between that point and the Waverly yard was built in 1892. The total length of the line is five miles.

At Waverly the small yard which was built some years ago has been enlarged for a temporary receiving yard and a long frame transfer house has been built at the south end. This transfer house has two tracks on each side which are separated by a covered platform running their entire length. Freight in less than carload lots and consignments for Newark, Jersey City and for connecting roads is reloaded here.

In order to bring the freight trains off of the main line into the Waverly yard and Greenville connection, a "jump-over" was built just south of Waverly station. The eastbound and westbound freight tracks on the main line lie between the passenger tracks and the "jump-over" was put in to avoid a grade crossing with main line eastbound passenger track in swinging the freight tracks to the south and outside. A very similar improvement at Bellevue, Del., was described in the *Railroad Gazette*, Oct. 7, 1904, the "jump-over" at that point being at the entrance to the Shellpot yard of the Philadelphia, Baltimore & Washington. At Waverly the eastbound passenger track begins to rise 2,000 ft. east of North Elizabeth station on a .4 per cent. grade until it reaches the cross-over bridge 2,800 ft. further east. From there on the grade is .75 per cent., descending. The bridge is a through plate girder structure of two 65-ft. spans resting on masonry abutments with long wing walls and steel columns between the freight tracks below. The freight tracks

are on a .4 per cent. descending grade so that when they pass under the passenger track by turning out on a 3-deg. 40-min. curve, the clearance under the bridge girders is 20 ft. The embankment for the passenger track is 25 ft. high at its highest point and 90 ft. wide at the bottom. Its center line is 115 ft. south of the westbound passenger track at the bridge. For about 900 ft. from the west end of the embankment a masonry retaining wall has been put in between the freight tracks and the bank.

The work at Waverly was complicated somewhat by a road crossing just west of the cross-over. To do away with an arch under the embankment and a grade crossing over the other three tracks, Neck Lane was deflected to the west about a thousand feet and depressed into a cut to carry it under all four tracks. A 24-ft. stone arch with 18 ft. clearance was put in under the eastbound passenger embankment and a 24-ft. plate girder bridge with 12.5 ft. clearance was put in under the other three tracks. The road turns east again along the north side of the tracks and joins the old road at the original crossing. This work was completed last summer and is now in use.

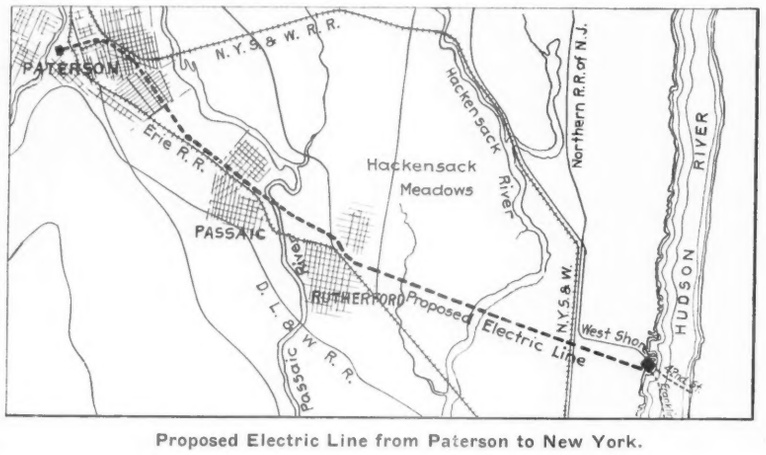
Mr. W. C. Bowles, Engineer of Construction, has had entire charge of the Greenville and Waverly improvements, and we are indebted to him and to Mr. L. H. Barker, Assistant Chief Engineer, for the drawings and information.

Proposed High-Speed Double Track Electric Line from Paterson to New York.

The route of the electric line proposed to be built by the New York & North Jersey Rapid Transit Company from Paterson, N. J., to New York is shown in the accompanying map. The Paterson terminal will be on Church street, between Market and Ellison streets. The road will be elevated for a distance of 2,500 ft. through the city and will come to grade at the city limits. It is then projected parallel to the Erie Railroad as far as Passaic. From Passaic, the line as surveyed strikes off in a northeasterly direction through Rutherford, and from Rutherford it will take a straight course across the Hackensack Meadows to the Bergen hill, where it will pass through a tunnel 4,900 ft. long to its Weehawken terminal at the West Shore ferries opposite Forty-fourth street, New York City, from which point passengers will be taken to New York by the West Shore ferry boats and landed at either Forty-second street or Franklin street. The line will be double-track and rock ballasted throughout. There will be no grade crossings. The total length of the line will be 13.6 miles, three miles of which, including the portions through Paterson, Passaic and Rutherford, will be elevated. The road will also be elevated over the tracks of the New York, Susquehanna & Western and the Northern Railroad of New Jersey, which are located about 2,000 ft. west of the proposed tunnel through Bergen hill.

It is estimated that this tunnel will cost upwards of $700,000. The maximum grade of the proposed road will be about 2 per cent., and its maximum curvature will be 10 deg. The power house and car barns will be located on the Hackensack Meadows at the point where the road crosses the Hackensack river. The motive power will be supplied by a third rail. The cars will be of steel and will be operated by the multiple unit control system, the same as that used on the New York Subway. It is proposed to run six-car trains, eight per hour, between the hours of 6 a.m. and 8 p.m.; two express trains each way and two local trains each way. The time of the express trains from terminal to terminal is figured at 20 min., and the time of the local trains at 30 min. Between the hours of 8 p.m. and 1 a.m. two local trains will run each way each hour, and between 1 a.m. and 6 a.m. one local train will be run each way per hour.

When the proposed road is built it will compete with the Erie, as stated, and also with the New York, Susquehanna & Western. The distance from Paterson to Jersey City by the Erie is 17 miles, and the distance by the New York, Susquehanna & Western is 26 miles. The present fare to New York by the Erie is 50 cents for a single ticket and 70 cents for a round trip ticket. The rates on the electric road are proposed to be 25 cents single and 50 cents return. It is the plan, also, to issue monthly commutation tickets. These will be sold for $5.80 per month, the same price as the Erie now charges. It is estimated that upwards of 230,000 people will be served by the new line. The company now has three engineering corps in the field, and it is expected that actual work on the new line will be under way within five months. The estimated cost is $7,000,000, and it will be at least two years before the line is ready for operation. William Barbour, President of the Linen Thread Company of New York, is the President of the company, and M. R. McAdoo is the Vice-President and General Manager; the others interested are John W. Griggs, President of the Paterson National Bank and ex-Attorney-General of the United States; John R. Lee, Henry H. Parmelee, of Paterson; Edmund L. B. Gardiner, Ridgewood, and Hobart Sprague, New York.



Proposed Electric Line from Paterson to New York.

Improvements on the New York, New Haven & Hartford.

The New York, New Haven & Hartford is a unique American railroad in many respects. It is one of the few large roads which is independent of the so-called great railroad systems controlled by a few men and dominating the transportation facilities of the United States. All of its 2,031 miles of line lies in four states, and in two of these, Connecticut and Rhode Island, it has a practical monopoly of the steam railroad business and owns and controls much of the street railroad and interurban electric business. It serves the most densely populated and most important manufacturing region in the country, and has New York and Boston as its terminals. The traffic conditions, therefore, are much more like those of English or Continental railroads than of any other of the big railroad systems in this country. It is probably the only important American railroad whose passenger earnings for a long period of time exceeded its freight earnings, despite the fact that it serves the chief manufacturing centers of New England. The accompanying map shows the company's network of main and branch lines covering every part of southern New England. Beginning at New York, the passenger terminal is the Grand Central Station, the New York, New Haven & Hartford using the tracks of the Harlem Division of the New York Central from Woodlawn on down under an agreement of lease. The freight terminal in New York is at Oak Point, at the junction of the Harlem river and the East river. This is a tide water yard and all freight received and delivered is ferried on car floats or lighters around New York Harbor. The Oak Point yard is connected with the main line at New Rochelle by the Harlem River & Port Chester, 11.5 miles long, which is operated under a perpetual lease. This is a double-track line and besides the freight traffic carried over it, suburban trains are also run connecting with the Second and Third avenue elevated roads of Manhattan at 129th street. The through Boston-Washington expresses are also diverted to Oak Point and ferried around the island to the Pennsylvania station at Jersey City.

The main line, beginning at Woodlawn, is double-tracked to Mt. Vernon and is four-track from Mt. Vernon to New Haven, the geographical center of the western lines. East and north from New Haven are the Shore Line, to New London, Conn., Providence, R. I., and Boston, double-tracked all the way; the Air Line to Willimantic, Providence and Boston, single track to Willimantic, and the Springfield line to Hartford, Conn., and Springfield, Mass., double-tracked and connecting with the Boston & Albany into Boston. This gives three different routes from New Haven to Boston, all nearly the same distance, and with about equal local traffic. Between Boston & Providence is a network of branch lines acquired at the time of the lease of the Old Colony Railroad. In 1899 the New Haven leased the Central New England and obtained a through line from Boston through Hartford to Poughkeepsie, N. Y., on the Hudson river. In connection with the New Haven's recent purchase of the control of the New York, Ontario & Western and the Poughkeepsie Bridge, which forms a connecting link, this line is sure to become an important factor in the future development of the system.

The growth of traffic on the New York, New Haven & Hartford, both freight and passenger, has been steady and rapid during the last eight years. The accompanying table gives some of the principal statistics of operation for the eight years ending June

30, 1904. It will be seen that the gross earnings from freight have nearly doubled in that time and that the passenger earnings have increased almost as much. At the same time the receipts per ton-mile have decreased nearly one cent, and operating expenses per revenue train mile have increased 18 cents. To keep pace with the increasing traffic, extensive improvements everywhere along the road were necessary, and some

yard facilities were inadequate and, near New York, the large suburban traffic which has developed has been handled with increasing difficulty until at the present time it promises to interfere seriously with the through passenger business.

Perhaps the most important single piece of work which is now planned for is the rebuilding of the Harlem & Port Chester, changing it into a six-track road operated by

lawn, 3½ miles, is also a future possibility. This branch would serve Pelham, Mount Vernon and Woodlawn, and would allow the entire suburban traffic to be diverted from the New York Central tracks into the Grand Central Station. When the line is rebuilt the Oak Point yard will be enlarged and utilized to its full capacity. As a temporary relief to the congestion at the lower end of the New York division, the four-track main

SUMMARY OF OPERATING STATISTICS OF THE NEW YORK, NEW HAVEN & HARTFORD FOR EIGHT YEARS ENDING JUNE 30, 1904.

	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.
No. of passengers carried	41,599,670	41,464,748	49,035,411	52,096,916	53,051,460	58,838,131	63,714,199	63,130,459
Gross earnings—passenger	$15,967,864	$15,901,669	$18,384,830	$19,764,755	$19,853,093	$21,223,631	$22,953,017	$23,425,173
Gross earnings—freight	$13,340,213	$14,081,856	$18,381,848	$20,164,753	$19,864,700	$21,871,642	$23,926,150	$24,413,541
Gross earnings—total	$29,308,077	$29,983,525	$36,766,678	$39,929,508	$39,717,793	$43,095,273	$46,879,167	$47,838,714
Receipts per ton-mile	$0.01538	$0.01511	$0.01411	$0.01451	$0.01479	$0.01455	$0.01414	$0.01423
Tons carried one mile	839,960,369	899,636,294	1,257,413,624	1,340,789,590	1,292,378,364	1,444,544,216	1,627,858,848	1,661,382,186
Passenger train mileage	10,248,807	10,933,182	13,222,845	13,569,271	13,898,315	14,687,835	15,362,062	15,775,762
Freight train mileage	4,925,278	4,845,456	6,129,106	6,344,144	5,969,950	6,395,676	7,231,806	7,836,361
Average tons of freight in train	165.98	180.90	201.00	204.11	268.13	217.58	218.19	208.58
Average tons in loaded car	9.34	9.43	10.10	10.20	10.29	10.65	11.13	11.69
Average mileage operated	1,441.88	1,441.88	2,017.59	2,032.10	2,027.34	2,027.34	2,027.34	2,031.58

years ago this work was begun at several points. The new South Terminal Station at Boston was put into use during 1899, and with the other minor improvements in connection with that work, the New Haven now has a model passenger terminal in that city. During 1896 and 1897 the main line from Woodlawn Junction to New Haven was changed to four tracks except through Bridgeport, where the work was held up by legal complications. Aside from these and

electricity. The general outline of this proposed improvement which is now before the Board of Estimate and Apportionment of the City of New York was printed in the *Railroad Gazette*, Sept. 2, 1904. The line which at present is a double-track road extends from a connection with the Manhattan Elevated Second and Third avenue lines above 129th street, up through the Bronx and Westchester County to the main line at New Rochelle. The New York freight

line is being extended through Mount Vernon to Woodlawn. This work consists chiefly of widening the rock cut south of the Mount Vernon station and building a new retaining wall. Most of the excavation has been completed and the wall is finished for a distance of several hundred feet.

The Bridgeport improvements, which were delayed by legal complications for some time after they were first planned, were be-

Map of the New York, New Haven & Hartford Lines.

a few other improvements of minor importance, however, no new work was begun until the present President, Mr. Charles S. Mellen, came into the management of the road and began on a programme of improvements extending from New York to the Connecticut river which, when completed, are expected to greatly relieve the congestion on the main lines and permit of increased speed and tonnage of trains. Many of the bridges were old and unsafe for high-speed trains, the

terminal yard at Oak Point is connected with it, and all freight is taken to and from the main line over this route. It is proposed to entirely rebuild the line, eliminating all grade crossings and to operate at least two and possibly four of the six tracks with electricity. The proposed extension of the Subway through the Bronx to West Farms would give a connection at that point with that newest rapid transit system. A branch from West Farms north to Woodgun in 1901 and are now nearly completed. They consist of the elimination of 27 grade crossings by carrying the four tracks through the city partly on a steel viaduct and partly on a solid fill between stone retaining walls, some slight changes of alinement, the erection of a large new passenger station, and a four-track twin Scherzer rolling lift bridge over the Pequonnock river. The solid fill begins in the western part of the city and extends to State street, about

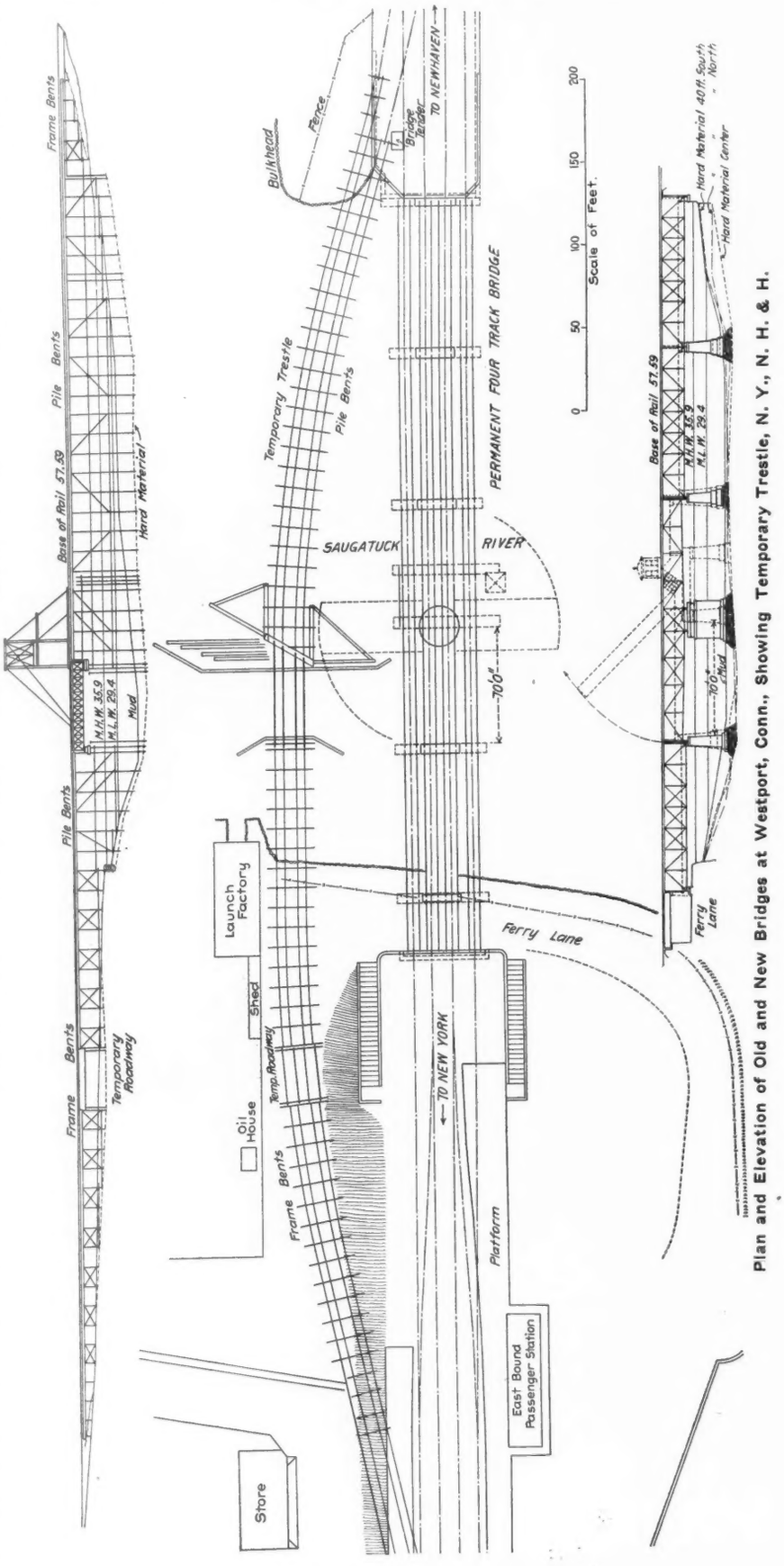
two miles. The steel viaduct extends through the station and across the river, being 2,300 ft. long. Beyond this is another solid fill to the eastern end of the city, making the entire elevated structure about 3½ miles long. The new station is a buff brick building, two stories high, the second story being on the track level. It is now well under way and will probably be ready for use within a few months. A full account of the general improvements at Bridgeport was printed in the *Railroad Gazette*, March 1, 1901; July 25, 1902, and July 5, 1903. The station building was illustrated and described in the issue of Jan. 22, 1904.

At New Haven the congestion of traffic with the present facilities is acute. The four-track main line and the branch to Derby, Conn., enter the city from the west and the Northampton, Springfield, Air Line and Shore Line divisions enter it from the east. The last three named divisions converge at Cedar Hill, 1½ miles east of the New Haven station, and run through the city in a narrow double-track walled cut. For a part of the distance the Northampton division runs in on the same tracks, and the result is that five tracks on the west and six tracks on the east are choked down to two tracks through the city. New Haven is the collecting and distributing point for freight from all the company's eastern lines bound to or from New York and the west and south, and all of this freight together with the heavy passenger traffic must be handled over the short two-track line through the city. The eastbound receiving yard on the south side of the passenger station is too small to store the accumulation of freight from the west, and the westbound receiving and classification yard at Cedar Hill on the east side is also badly congested.

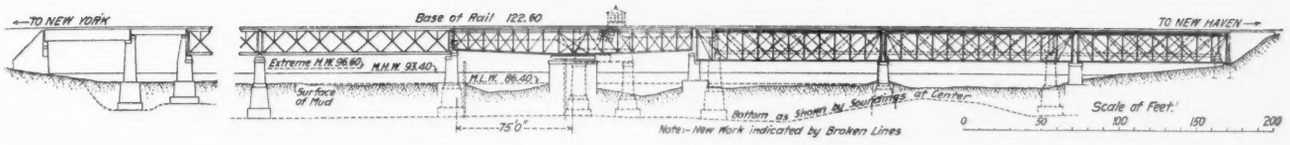
Plans have been prepared and approved by the Connecticut State Railroad Commissioners for widening the cut through New Haven for four-tracks with 13-ft. centers and increasing the head room under the highway crossing bridges. Some slight changes in the alinement will be made to take out a number of light curves on the old location. This improvement when completed will relieve the congestion of freight on both sides of New Haven and will obviate the frequent delays to passenger trains occurring from the same cause.

Beyond New Haven the only work of importance undertaken recently or in contemplation is the new division classification yard which has been built at Midway on the Shore Line just outside of New London, new freight terminals at Hartford, and the Fall River grade crossing improvement. The Midway yard is half-way between New York and Boston and will be the division point for freight between these two cities. A complete icing plant, coal pockets and round house have been built and suitable quarters provided for train crews. The Fall River improvement is completed and has been in use for some time. All grade crossings in the city have been done away with by elevating the tracks as was done at Bridgeport.

The Hartford improvements consist of an entire rearrangement of the freight terminals in that city by which they will be combined in one big yard with inbound and outbound freight houses on the east side along the river. A new stone highway bridge is being built over the Connecticut river at Morgan street, and the grading for the approaches made necessary a change in the old Valley Branch tracks and yard at that point. This change has been planned to greatly enlarge the freight handling facilities and to combine in one yard the several smaller yards scattered at different points about the city. The plans provide for the utilization of a large triangular piece of ground north of Morgan street along the river, having a frontage on Morgan street of 600 ft. and running back about 1,600 ft. On the west side of this tract will be the inbound freight house, 800 ft. x 50 ft. The south end of this building, fronting on Morgan street, will be two and a half stories high and will be used for offices. The outbound house, which is parallel to the inbound house, will also be 800 ft. long and 35 ft. wide. In between the



Plan and Elevation of Old and New Bridges at Westport, Conn., Showing Temporary Trestle, N. Y., N. H. & H.



Elevation of Old and New Bridges at Cos Cob, N. Y., N. H. & H.

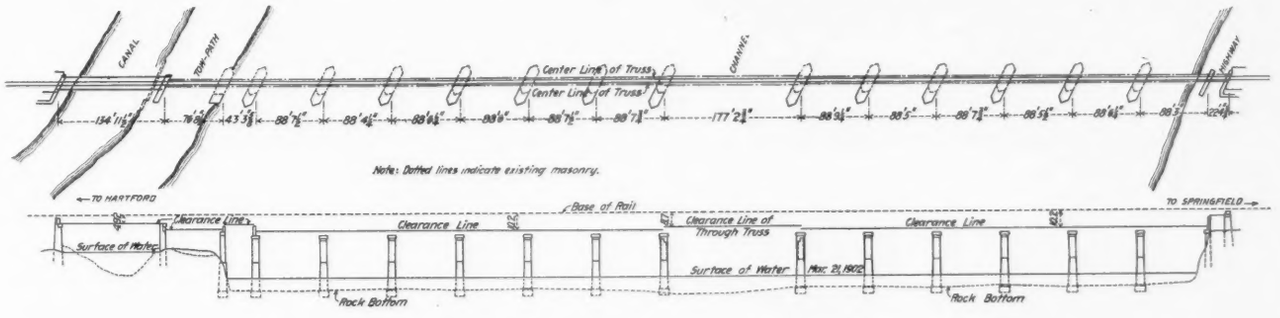
two will be a covered transfer platform 16 ft. wide, and two tracks separate both the inbound and outbound houses from this shed. Both of the freight houses will be of brick with wood floors and slate roofs, and will have 10-ft. platforms with overhanging shelter roofs running entirely around them. A 48-ft. paved driveway will run around the two houses and will connect with Morgan street on the south end and Pleasant street on the north end. In the triangular space formed by Morgan street, the outbound freight house and the tracks of the Valley Branch will be 11 team tracks of different lengths leading off from one ladder track and north of the freight houses will be 11 other team tracks, giving a total length of track of about 11,000 ft., or storage for 300 cars. These tracks will be separated by macadam driveways 30 ft. wide. The contract for this work has been let to Horton & Hemmenway, of Hartford, and it is expected that the yards and houses will be completed in about a year. When finished this will be the largest freight terminal in Connecticut.

Considerable progress has been made in double-tracking some of the important branch lines and changing the main line tracks from 12-ft. to 13-ft. centers. The Naugatuck Division has been double-tracked from Naugatuck Junction north 10½ miles, and contracts have been let to the J. J. O'Brien Contracting Co., of Seymour, Conn., for continuing this work further north. Five miles of second track has also been laid on the Northern Division between Framingham and Southboro, and three miles have been laid on the Shawmut Branch. On the Highland Division, which has become an important line since the purchase of the New York, Ontario & Western, the second track has already been completed between Hopewell Junction and Stormville, four miles. Contracts have been let to C. W. Blakeslee & Sons, New Haven, and John W. Daly & Co., New Rochelle, for extending this stretch of double-track to Towners, on the Harlem Division of the New York Central, 15 miles. A curious case of disappearing embankment has been encountered on this section at a point where the track skirts the edge of Storm Lake. Within a few weeks the new embankment sank under the water six times. The last time about 60 ft. disappeared and a small island was forced up from the bottom of the lake some distance out from the shore. This island eventually sank again. Hundreds of carloads of rock and dirt have been dumped into the sink hole apparently without much effect.

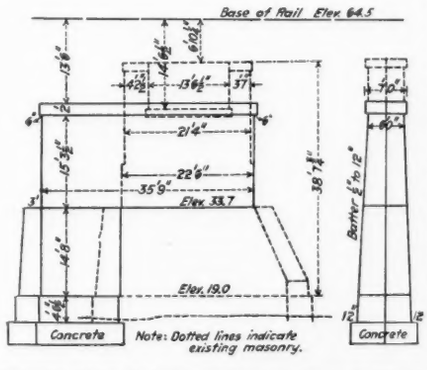
It has been a curious anomaly on the New York, New Haven & Hartford that with an otherwise exceptionally good roadbed and track, its bridges have been given so little attention, and at the present time many of them are not safe for heavy engine loads or high speeds. Even on the main line the principal bridges have been neglected and allowed to remain a hindrance to fast time or economical train movement. Between New York and New Haven there are three important crossings of navigable streams, and for a long time slow orders have been issued for each of them. The old bridge over the Pequonnock at Bridgeport was replaced with a four-track Scherzer rolling lift bridge when the other improvements were made at that point, but only recently have steps been taken to replace the old light bridges at Cos Cob, Westport and the crossing of the Housatonic, which are equally important. In connection with the other substantial improvements being made these bridges are to be replaced and also the bridge over the Connecticut river at Warehouse Point on the Springfield Division above Hartford. The bridge over the Connecticut at Lyme on the Shore Line is also to be replaced in the near future, and the Thames river drawbridge at New London is to be rebuilt and strengthened. All of these bridges are not considered safe for engines weighing more than 157,000 lbs. and 100,000-lb. cars are not allowed to run over them loaded to their full capacity. The company's new bridge specifications adopted some time ago provide for a loading of two engines weighing 219,000 lbs. each, with tenders weighing 112,000 lbs., or practically the equivalent of Cooper's E-50 specification. Liberal allowance for impact makes even heavier loading safe.

The old bridge at Cos Cob, which is now being renewed, was a two-track, deck truss structure of seven fixed spans and one center pier draw span with two deck plate girder approach spans on the west end. The rails were 29.2 ft. above mean high water. The four fixed spans on the west end were 185 ft. long, the draw span 235 ft. long, and the fixed spans on the east end were 180 ft. long. The trusses on the west end are in good condition and will not be renewed. The piers are being widened on both sides by building on to the existing masonry, and the two additional trusses needed for four tracks will be erected on the outside of the present trusses. On the east end, however, the old trusses are being taken down and new piers built for three spans identical with those on the east end. A twin pair of double-track Scherzer rolling lift bridges is to span the main channel, giving a 75-ft. clear opening. Two new piers will be built to support the roller bearings and a short deck plate girder will connect the lift spans with the fixed span to the east. During the renewal trains are being run over a two-track pile bent trestle built about 130 ft. north of the center line of the old bridge. The bents are spaced 12 ft. apart and over the channel a temporary 35-ft. wooden movable span has been put in. The old bridge is being dismantled with derricks on shore and on lighters and temporary shoring was put in to support the structure while the work is in progress. Daly & Holbrook are the contractors for the substructure of this bridge and the bridge at Westport. The steel work is being supplied by the Pennsylvania Steel Company.

The bridge renewal at Westport over the Saugatuck river is being done under conditions very similar to those at Cos Cob. The old bridge at this point, which consists of three 90-ft. fixed deck truss, double-track spans and one deck truss draw span, will be replaced by three deck plate girders of the same span and a pair of twin double-track Scherzer rolling lift bridges having a clear opening of 70 ft. The foundations of the old piers will be made use of, but the masonry is to be taken down and replaced with piers wide enough for four tracks. A temporary trestle built around the bridge



Location Plan of New Bridge Over the Connecticut River at Warehouse Point.



Rebuilt Piers for Connecticut River Bridge.

site carries the traffic while the renewal is being made. The accompanying drawing shows the old and new bridges and the location of the temporary trestle. This work and the renewal of the Cos Cob Bridge is now well under way, the old piers and superstructure being almost entirely removed. Daly & Holbrook are the contractors for the substructure and the Passaic Steel Company for the steel work.

The Housatonic river bridge, which is a double-track through pin-connected truss structure without a draw span, will be renewed a little later on. On account of the ice which moves out of the river in the winter a temporary trestle cannot be built around this bridge, so that in changing it over to a four-track structure a new double-track bridge will be built to one side and completed ready for use before the old trusses are dismantled.

The Warehouse Point bridge renewal is the most important and most urgently needed improvement to the bridges of any now being made. It is a single-track deck truss bridge over the Connecticut river above Windsor Locks, and will be replaced with a deck plate girder structure of 12 deck girders about 88 ft. 6 in. long, and one through truss 177 ft. 2¾ in. long over the main channel. A through span and a short plate girder form the approach at the west end over the Windsor Canal and tow-path, these spans having been erected some time ago. No change will be made in the location of the old piers, but the foundations and masonry will be changed as shown in the accompanying drawing, by adding on a new concrete footing on the down-stream side and building up the superstructure of the piers to the proper height bonding in the old and new stone work. Because of the length of the bridge, putting in a temporary pile trestle over which trains could be run during erection was an expensive method, so that the new bridge will be erected and the old bridge dismantled without delaying trains or deflecting traffic. The rebuilt piers are all completed and the plate girders for the south track will be unloaded and placed from cars on the old bridge. When the south track is ready the north track on the old bridge will be thrown out of use and the spans dismantled. Before this is done, however, the through span over the channel will have been erected by means of a traveller and falsework supported from the bed of the stream. This part of the work is nearly done and the entire bridge will be ready for use by the early summer. The American Bridge Company is the contractor for the steel work and erection of the superstructure, and Daly & Holbrook are the contractors for the substructure.

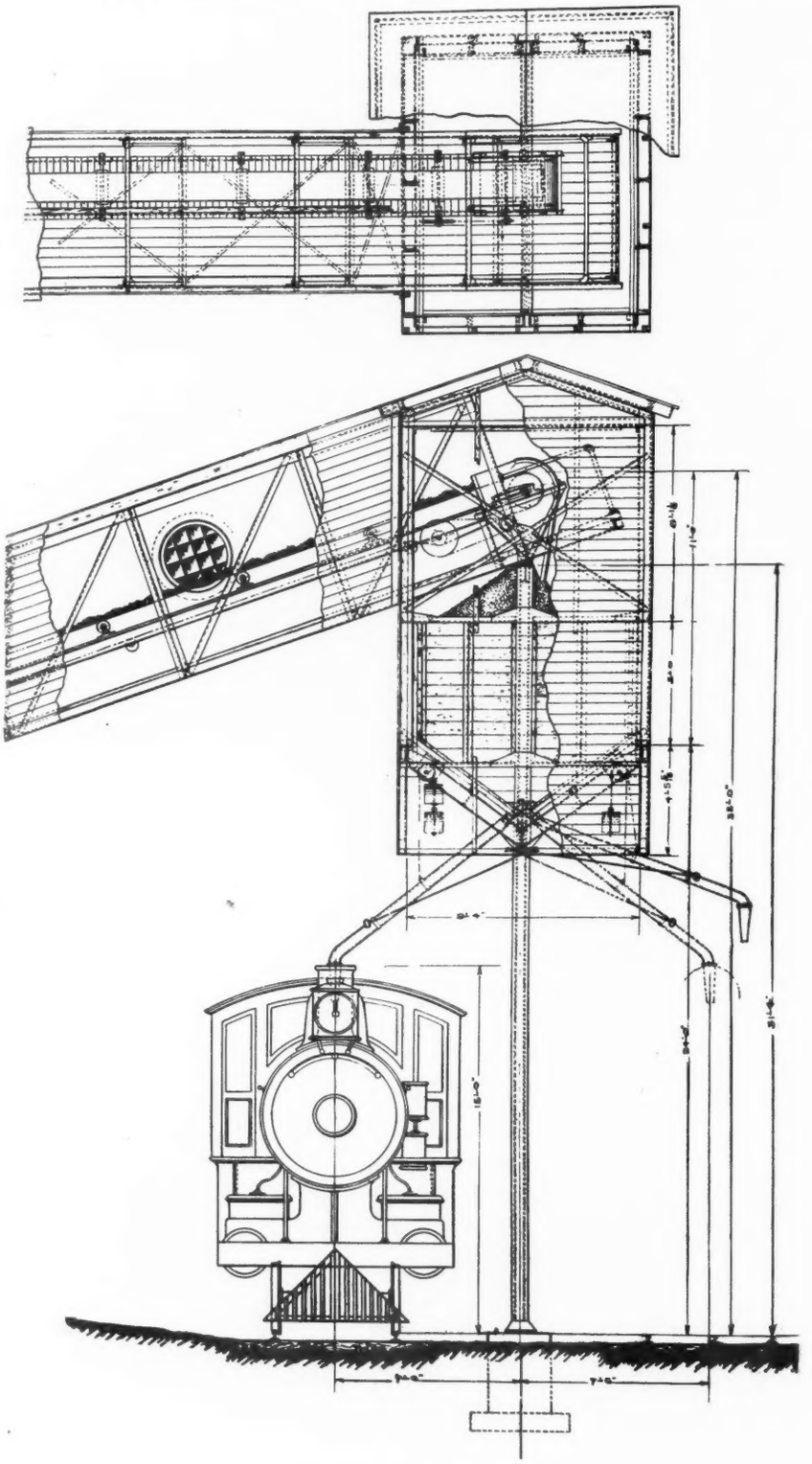
In addition to the work already described the New York, New Haven & Hartford has prepared plans for a new bridge over the Connecticut river at Lyme on the Shore Line, and Congress has the plans under consideration. If approved the new bridge will consist of seven fixed truss spans and a 145-ft. draw span over the channel. Elevation of tracks and abolition of grade crossings is also being planned for at Worcester and Attleboro, Mass., and at Waterbury, Conn. When these changes are all completed, yards enlarged to relieve freight congestion, and bridges strengthened to carry heavy engines at high speeds, a 4½-hour service from New York to Boston will be easily possible and much more economical methods of handling freight can be practiced. The limitations of freight train service on the line at present are not grades or lack of track room in the open but insufficient yards and weak bridges, and when these limitations are removed the desired economies can be accomplished.

We are indebted to Mr. C. M. Ingersoll, Chief Engineer, for the data and drawings from which this summary of the company's improvement work has been prepared.

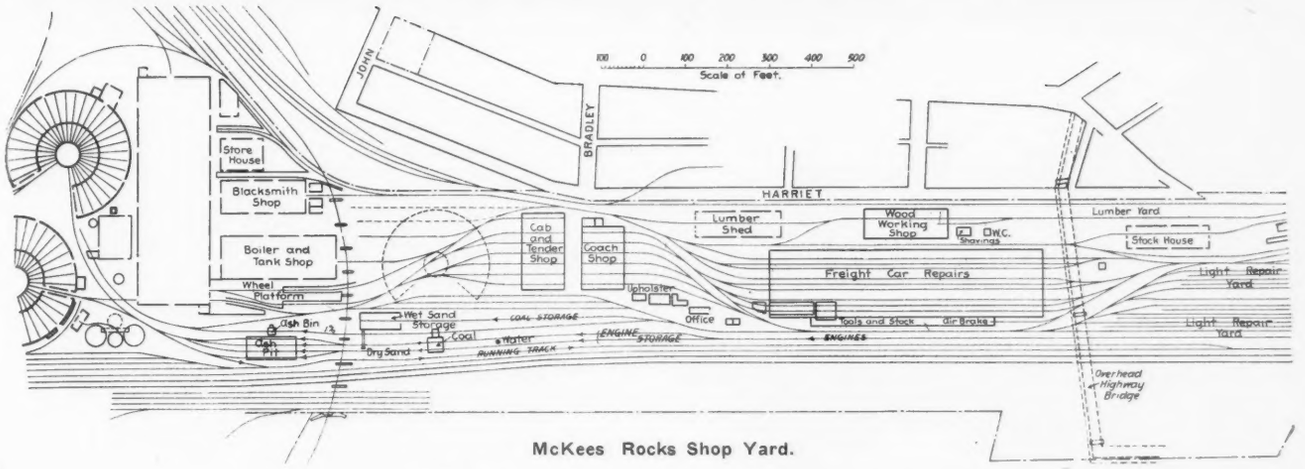
Coal, Sand and Ash Handling Plants at McKees Rocks.

The Pittsburg & Lake Erie has lately completed at McKees Rocks locomotive coaling, sanding and ash-handling plants that are in keeping with the fine shops and locomotive terminals opened to service something more than a year ago. The plants are separate units, as may be seen from the accompanying plan of the shop yard. The coaling and ash-handling plants are of steel frame construction enclosed with drop siding and roofed with granite roofing. In the sanding plant, both wood and steel are used in the framing, the outer covering being the same as for the other two plants. All foundations are of concrete.

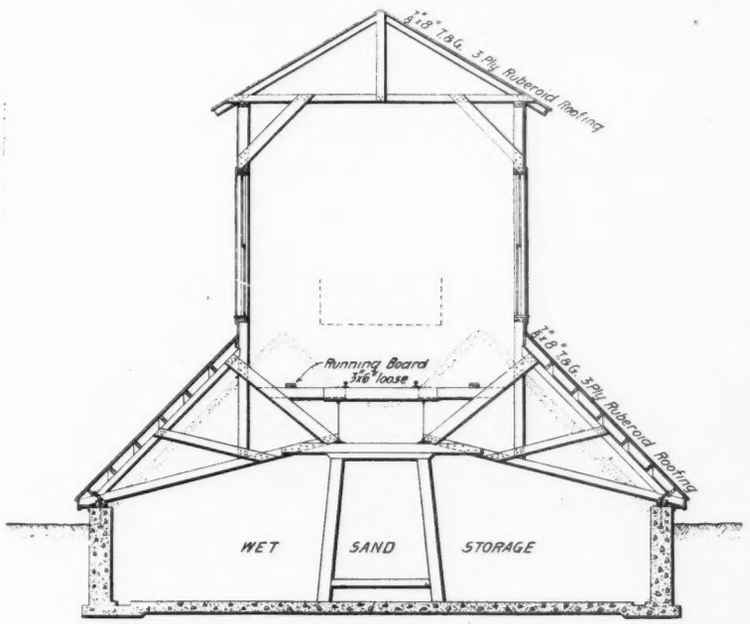
The locomotive coaling station has a capacity for handling 70 tons of mine-run coal an hour, and a storage capacity of 500 tons.



Partial Details, Sand Handling Plant.

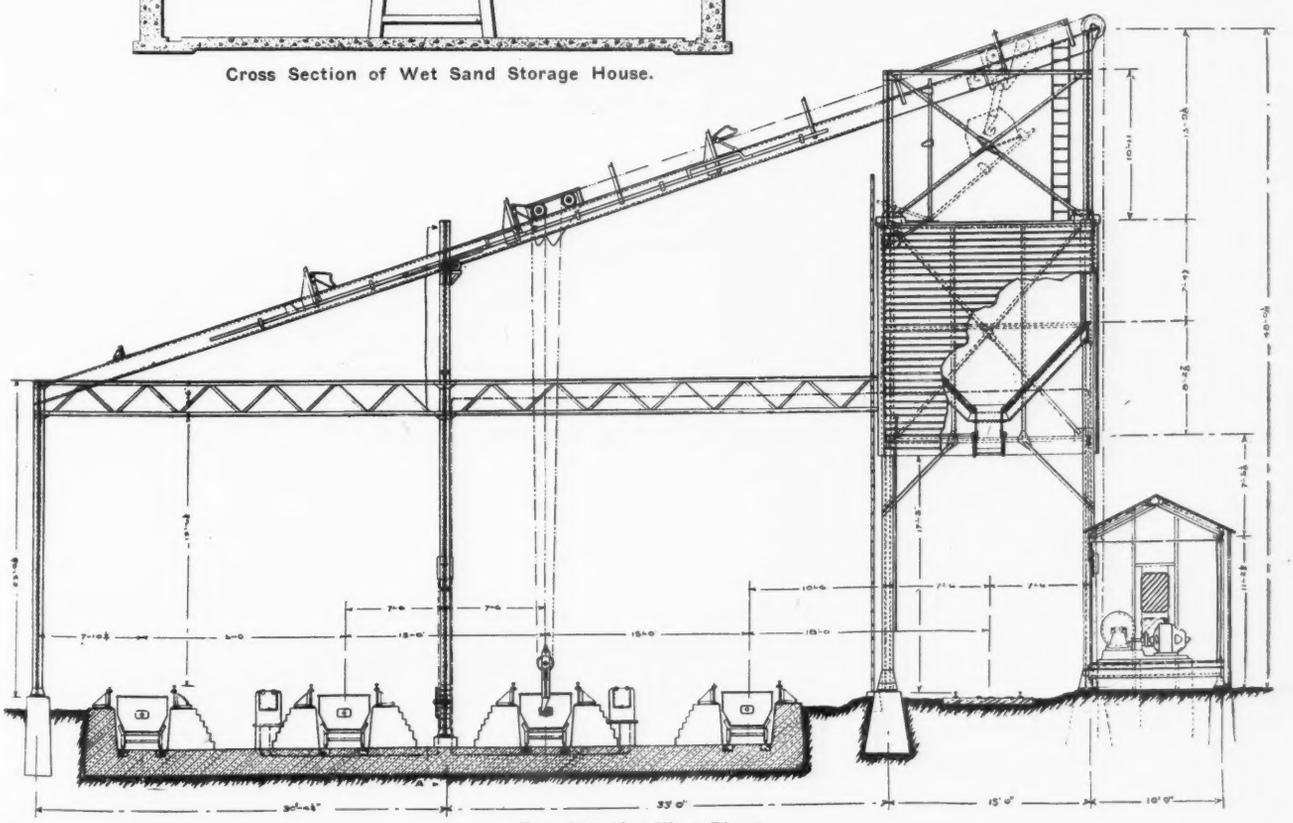


McKees Rocks Shop Yard.



Cross Section of Wet Sand Storage House.

A storage track for holding a supply of loaded coal cars is built on a grade of three-quarters of 1 per cent. so that the cars may be run by gravity to the dumping hopper of the station. The storage track has space for ten 50-ton cars, and there is room for the same number of empties below the station. The cars dump into a track hopper below which is a feeding device, a sort of plunger working horizontally, for regulating the supply of coal to the elevator below. This feeding device may be adjusted to suit different grades of coal. The station spans two tracks and can serve locomotives on each simultaneously. The bottom of the storage bin is hoppered and is fitted with four under-cut gates feeding to the tender through counter-balanced chutes. This arrangement, it is claimed, secures a minimum drop of coal with all of the advantages of an end-loading chute. The gates and chutes are operated from a platform between the tracks at the height of the tender top. Protection against the heat and gases from the locomotives is afforded by a concrete and expanded



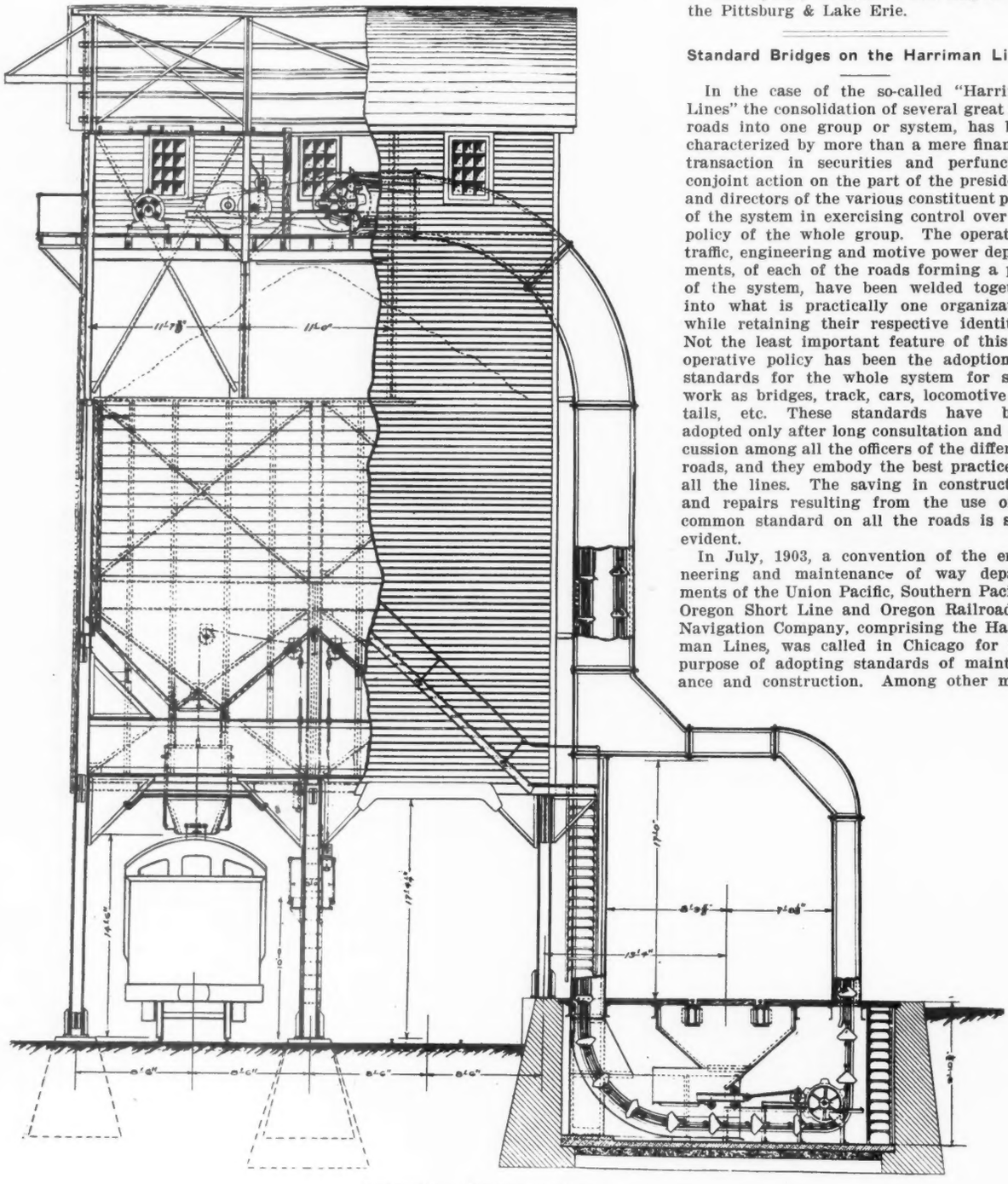
The Ash Handling Plant.

metal canopy extending over each track, with openings through for the hoppers.

Each track under the coaling station connects with two ash-pit tracks. The ash-handling plant has practically one large concrete pit with four parallel tracks each 120 ft. long. The track rails are laid on I-beams carried on vitrified brick pedestals spaced 5 ft. centers. The ash buckets, six to each track, rest on trucks which run on 20-lb. rails spiked to 6 in. x 8 in. x 3 ft. timbers embedded in the cement bottom beside each pedestal. The trucks may be shifted by hand to bring them under an inclined runway spanning all four tracks, and connecting at the high end with an elevated bin at one side of the pits. The buckets are raised, conveyed to the bin and dumped automatically by means of a trolley on the runway and a motor and winding drum in a motor house on the ground beside the bin. The motor is governed by either of two controllers, one between each pair of pit tracks. The method of operation is such, however, that after a bucket starts to rise it needs no further attention from the operator until it has dumped and stopped automatically. The ash bin has a capacity of 35 tons and has a concrete and expanded metal lining. The bin track is a continuation of the coal supply track, enabling the ashes to be dumped into the empty coal cars.

The sand plant embodies a number of new features. The wet sand storage house, situated between the coaling and ash-handling plants and at one side of the tracks connecting the two, covers and encloses a large concrete lined pit into which the sand is dumped directly from the cars on a trestle in the middle of the pit. The storage capacity is 2,000 tons. A power shovel transfers the sand from storage to the foot of the wet sand elevator, which deposits it in five-ton hopper surrounding two cylindrical stoves. As the sand drives it falls through a screen into the dry sand hopper, from which it is taken by the dry sand elevator to a belt conveyor on the top, or motor, floor. The belt conveyor carries it across to the dry sand overhead storage bin located between the two tracks from the coaling station. This bin has a capacity of 20 tons and is equipped with spouts for drawing off the sand by gravity. This plant, as well as the other two, is electrically operated.

These plants were designed by Heyl & Patterson, Contracting Engineers, Pittsburg, who also built them, with the exception of the wet sand storage house and all foundation work. Our data were furnished by Mr. A. R. Raymer, Assistant Chief Engineer of the Pittsburg & Lake Erie.



Locomotive Coaling Station.

Standard Bridges on the Harriman Lines.

In the case of the so-called "Harriman Lines" the consolidation of several great railroads into one group or system, has been characterized by more than a mere financial transaction in securities and perfunctory conjoint action on the part of the presidents and directors of the various constituent parts of the system in exercising control over the policy of the whole group. The operating, traffic, engineering and motive power departments, of each of the roads forming a part of the system, have been welded together into what is practically one organization while retaining their respective identities. Not the least important feature of this co-operative policy has been the adoption of standards for the whole system for such work as bridges, track, cars, locomotive details, etc. These standards have been adopted only after long consultation and discussion among all the officers of the different roads, and they embody the best practice of all the lines. The saving in construction and repairs resulting from the use of a common standard on all the roads is self-evident.

In July, 1903, a convention of the engineering and maintenance of way departments of the Union Pacific, Southern Pacific, Oregon Short Line and Oregon Railroad & Navigation Company, comprising the Harriman Lines, was called in Chicago for the purpose of adopting standards of maintenance and construction. Among other mat-

ters considered, a set of standard bridge specifications was prepared and adopted and instructions were given to the maintenance of way department of the Southern Pacific Company to prepare a set of standard bridge plans to accompany the specifications. Preliminary sketches were made for a complete set of plans for each of the following: Deck plate girders of 20, 30, 40, 50, 60, 70, 80, 90 and 100-ft. span; riveted through trusses of 100, 110, 125, 140 and 150-ft. span, and pin-connected through trusses of 150, 160, 180 and 200-ft. span. These sketches were submitted to all of the roads for discussion and approval before final plans were made to be formally approved by the general managers and issued as standard.

Through the courtesy of Mr. John D. Isaacs, Engineer of Bridges of the Southern Pacific, we are enabled to begin the publication in this issue of the complete set of standard plans and the specifications. The accompanying illustrations show the 20-ft. I-beam girder span and the 30-ft. deck plate girder span. Drawings of the other bridges will follow in subsequent issues until the entire series is finished.

The 20-ft. I-beam bridge shown is composed of six 20-in., 90-lb. I-beams, three being laid under each rail. They are stiffened laterally by two plate end frames and two intermediate plate frames 16 in. deep in addition to which there is a system of diagonal top lateral braces of 3-in. x 3-in. x ⅜-in. angles. The estimated weight of one span for single track is 14,900 lbs.

The 30-ft. plate girder span is made up of a $^{9}/_{16}$-in. web plate 40 in. deep, two top and bottom angles 6 in. x 6 in. x ½ in., a top cover plate $^{9}/_{16}$ in. x 14 in. x 30 ft., and a bottom cover plate $^{9}/_{16}$ in. x 14 in. x 20 ft. 9 in. The depth of the girder, out to out of angles, is 4 ft. ½ in., and it is divided into eight panels by 3½-in. x 4-in. x ⅜-in. angles inside and out. The lateral bracing amply strong consisting of two diagonal end frames, one diagonal intermediate frame in the center, two intermediate top lateral braces and top diagonals joining the corners of the cross braces and frames. As far as possible the sizes and spacing of rivets has been made uniform to reduce the cost of construction. The estimated weight of one span for single track is 14,900 lbs.

The complete specifications for all bridges follow.

GENERAL.

1. *Preliminary Data.* The Railroad Company will furnish either general plans or such masonry diagrams and other data as are required to define the span and general characteristics of the structure.

2. *Approval of Plans.* Upon receipt of these, the contractor shall prepare detail plans in strict conformity therewith, complete sets of which shall be submitted in triplicate to the Railroad Company for approval.

3. *Detail Drawings.* These plans shall include:

(*a*) A stress sheet, which shall show a truss diagram, the dead and live load assumptions and the minimum and maximum stresses, the net area of cross-section, and the make-up of each member of the bridge.

(*b*) An erector's diagram which shall show clearly the marking and position of each member of the bridge.

(*c*) Detail shop drawings of all members and their connections.

4. *Commencement of Work.* Upon approval of these plans, but not before, work on the structure may be begun, and it is expressly provided that such approval in no way releases the contractor from responsibility for drafting or shop errors.

5. *Alterations.* After plans have been approved, alterations will be permitted only upon the written instructions of the Railroad Company.

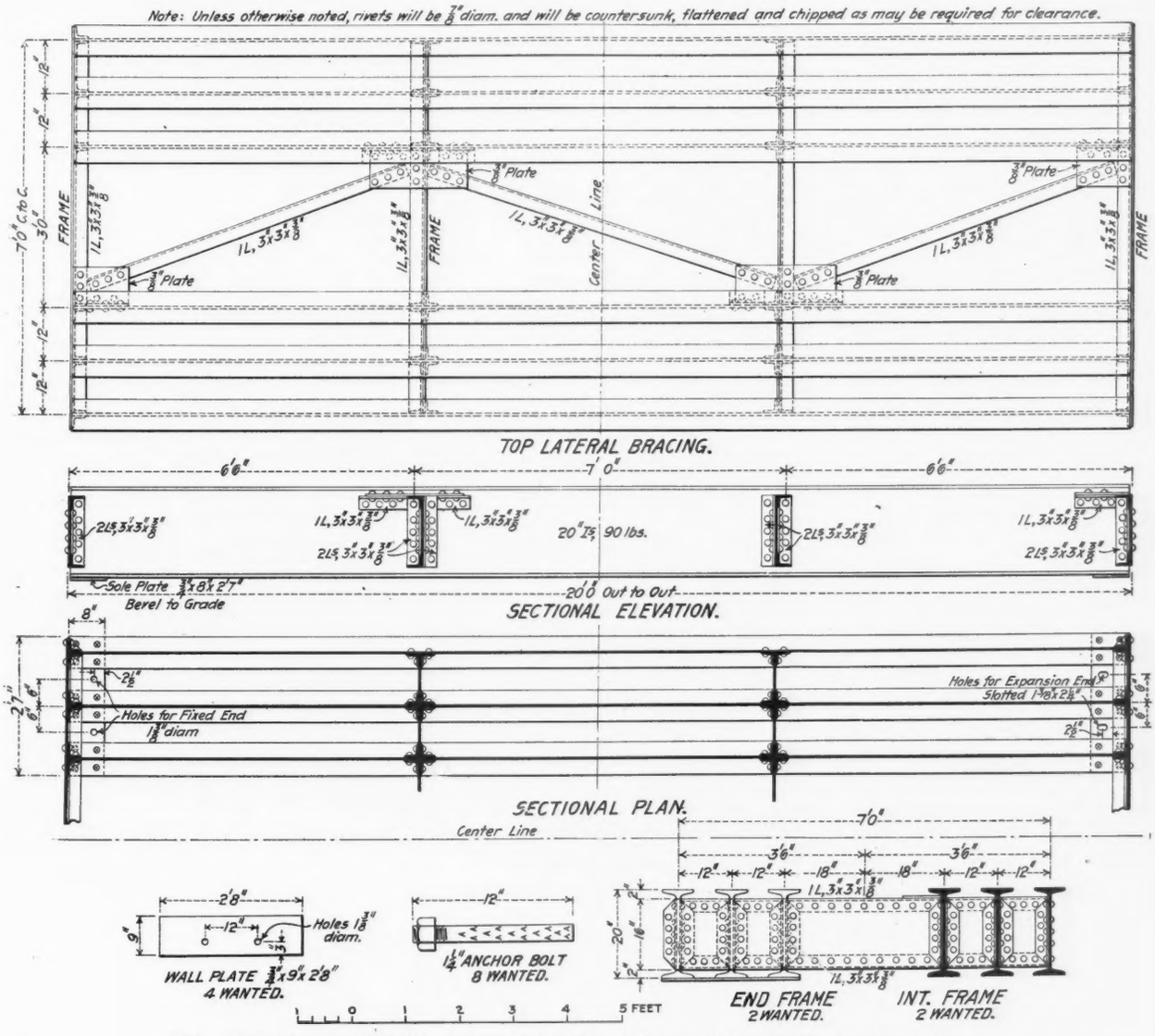
6. *Final Drawings.* Before shipment of material shall have begun, one complete set of plans on tracing cloth shall be furnished by the contractor without extra charge.

7. *Patents.* All claims for royalties on patented devices used in any structure shall be paid by the contractor.

8. *Inspection.* Such persons as the Company may appoint shall have free access at all times to the working drawings and shops of the contractor, for the purpose of examining the plans and inspecting the materials and mode of manufacture and construction.

MATERIALS.

9. *Floor System.* Ties and guard timbers,


Note: Unless otherwise noted, rivets will be ⅞" diam. and will be countersunk, flattened and chipped as may be required for clearance.
TOP LATERAL BRACING.
SECTIONAL ELEVATION.
20" I's, 90 lbs.
20'0" out to out
Sole Plate ¾"x8"x2'7"
Bevel to Grade
SECTIONAL PLAN.
Holes for Fixed End 1⅛" diam
Holes for Expansion End Slotted 1⅛"x2½"
Center Line
WALL PLATE ¾"x9"x2'8" 4 WANTED.
1¼" ANCHOR BOLT 8 WANTED.
END FRAME 2 WANTED.
INT. FRAME 2 WANTED.
5 FEET

Plan, Elevation and Details of Standard 20-Ft., I-Beam Girder Bridge, Harriman Lines.

rails and rail fastenings, as well as the necessary irons and labor of putting them in place, will be furnished by the Railroad Company.

10. *Kinds Used.* All parts of the structure, except ties and guard timbers, shall be of open-hearth steel; but cast steel shall be used for the rollers of swing-bridges, and cast iron and cast-steel may be used in the machinery of swing-bridges and, in special cases, for wall plates. Expansion rollers must be of bar steel or of cast steel of equal strength.

11. *Quality and Tests.* All steel shall be made by the open-hearth process and shall conform to the following requirements:

	Steel.	
	Medium.	Rivet.
Maximum phosphorus:		
Basic, per cent.	0.04	0.04
Acid, per cent.	.08	.08
Maximum sulphur	.05	.05
Ultimate tensile strength, in lbs. per sq. in.	60,000 to 68,000	46,000 to 54,000
Elastic limit, lbs. per sq. in.	33,000	26,000
Min. elongation in 8 ins., per ct.	22	26
Min. reduction of area, per ct.	37	..

12. In addition to above test, pieces cut from material three-fourths of an inch thick or less should bend to close contact when cold without showing signs of cracking, and rivet steel when nicked and bent 180 degrees around a bar whose diameter is equal to the thickness of the rod shall not break with a sudden square fracture, but must show a gradual break and a fine silky homogeneous fracture.

13. The tensile strength, elastic limit and elongation shall be determined by loading to point of rupture a specimen of not less than one-half square inch in section and not less than one-fourth of an inch in thickness, cut and planed or turned from a full-size section to a uniform section at least 9 inches in length, on 8 inches of which the elongation will be measured.

These test specimens shall be cut by the mill from finished material selected by the inspector, and shall be so selected that the different sizes and shapes in the order shall be as nearly represented as possible.

No final tests will be made on specimens rolled especially for test pieces.

Every melt or blow as well as every furnace heat from which material is furnished must be represented by the tests.

A bending test shall be made with each tensile test, if required.

The contractor must promptly furnish the inspector with copies of invoices of all materials shipped to fill these orders. Rejected material must not be shipped from the mill to fill any orders.

14. *Eye-Bar Tests.* Full-size eye bars shall be tested to destruction. In general the number of bars tested shall be about 4 per cent of the entire number of bars in the order, but in no case less than two bars from each order or from a single span, and selected so as to represent as well as possible the various sizes in the order. Test bars must be rolled, forged and finished at the same time and in the same manner as the entire order. From the finished bars the inspector shall select the bars to be tested, and the bars so tested shall conform to the requirements of Article 11 within a variation of 8 per cent.

LOADS.

15. All structures shall be proportioned to carry the following loads:

(*a*) *Dead.* The total weight of metal in the structure.

(*b*) *Floor.* A floor weighing 500 pounds per lineal foot of each track, which includes rails, rail fastenings, ties and guard timbers.

For the purpose of calculating stresses of trusses, three-quarters of the sum of the dead loads "*a*" and "*b*" shall be considered as applied to panel points of the loaded chord and one-quarter at panel points of the unloaded chord. The total weight of metal (*a*) in the structure as built, together with the weight (*b*) of the floor, must not exceed the dead load used in calculating the stresses.

(*c*) *Moving.* A moving load for each track consisting of trains, each composed of two consolidation locomotives (with weights distributed as per the following diagram), followed by a uniformly distributed load of five thousand (5,000) pounds per lineal foot. The maximum stresses arising from all positions of this moving load must be provided for.

16. *Wind.* The wind pressure shall be assumed acting in either direction horizontally:

(*a*) On the loaded structure at 30 pounds per square foot, on the exposed surface of all trusses and the floor system, as seen in elevation, in addition to a train surface of 10 feet average height, beginning 2 feet and 6 inches above base of rail, moving across the structure.

(*b*) On the unloaded structure at 50 pounds per square foot on the exposed surface of all trusses and the floor system as seen in elevation. In no case, however, shall the bracing of the loaded chord be designed for a less pressure than 500 pounds per lineal foot, of which 200 pounds per foot is to be considered as uniformly distributed, and 300 pounds per foot as moving load, and in no case shall the bracing of the unloaded chord be designed for a less pressure than 150 pounds per lineal foot considered as uniformly distributed.

(*c*) On the members of viaduct towers, as seen in elevation, 60 pounds per square foot on the loaded, and 100 pounds per square foot on the unloaded structure.

17. *Wind Anchorage.* In determining the requisite anchorage against wind pressure for the loaded structure the train shall be assumed to weigh 800 pounds per lineal foot.

18. *Braking Force.* For trestle towers and similar structures, also for the attachments of the fixed ends of all structures, the force induced by suddenly stopping the moving load (see Article 15, Clause "*c*") on any part of the structure shall be considered, the co-efficient of friction of the wheels upon the rails being assumed at 0.20.

19. *Centrifugal Force.* If the structure is on a curve a centrifugal force equal to 4½ per cent. of the moving load (see Article 15, Clause "*c*") on all tracks for each degree of curvature must be provided for. This force is to be applied 5½ feet above base of rail.

STRESSES.

20. *Conventional Distances.* In calculating stresses the following conventional distances shall be assumed:

Lengths of plate girders;—center to center of end bearings.

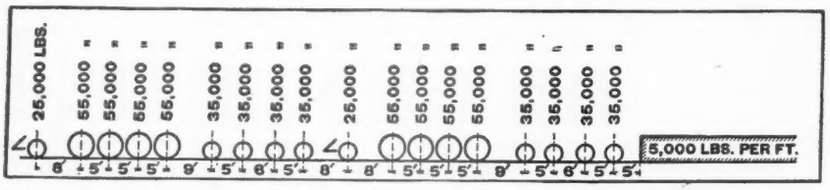
Lengths of trusses;—center to center of end pins.

Lengths of stringers;—center to center of floor beams.

Lengths of floor beams;—center to center of trusses.

Lengths of web members and laterals;—center to center of chords measured along the member.

Depths of plate girders;—back to back of flange angles where cover plates are used, and center to center of gravity of flange angles where no cover plates are used.



Depths of pin-connected trusses;—center to center of chord pins.

Depths of riveted trusses;—center to center of gravity of chord sections.

21. *Working Stress.* The greatest working stresses, in pounds per square inch, shall be as follows:

TENSION.

Rolled beams used as girders.	$7{,}000\left(1+\frac{\text{Min.}}{\text{Max.}}\right)$
Bars, forged ends	$8{,}000\left(1+\frac{\text{Min.}}{\text{Max.}}\right)$
Plates or shapes, net section.	$8{,}000\left(1+\frac{\text{Min.}}{\text{Max.}}\right)$
Floor beam hangers, plates or shapes for net section	6,000
Outside fibers of pins	18,000

SHEARING.

Pins and rivets. Hand-driven rivets, 20 per cent. less unit stresses. For knee bracing increase unit stresses 50 per cent.	7,500
Webs of plate girders	6,000

BEARING.

Projection semi-intrados, pins and rivets. Hand-driven rivets, 20 per cent. less unit stresses. For knee bracing increase unit stresses 50 per cent.	15,000

COMPRESSION.

Rolled beams used as girders, and compression members having lengths less than forty times the least radius of gyration; see Tension, plates or shapes, previously given.

Lengths more than forty times the least radius of gyration; reduce by the following formulas:

For both ends fixed

$$b = 8{,}000\left(1+\frac{\text{Min.}}{\text{Max.}}\right) - 35\frac{l}{r}$$

For one or both ends hinged

$$b = 8{,}000\left(1+\frac{\text{Min.}}{\text{Max.}}\right) - 45\frac{l}{r}$$

(*b*) Equals allowable working stress per sq. in.
(*l*) Equals length of member in inches.
(*r*) Equals least radius of gyration of section of member in inches.

No compression member shall have a length greater than 45 times its least width.

Outside fibers of pins..... 18,000

22. *Alternate Stresses.* All members subject to stresses of both tension and compression shall be designed to sustain both stresses with eight-tenths of the smaller added to each, the minimum of each being taken as zero.

23. *Combined Loads.* For combined live, dead, wind and centrifugal stresses, increase the preceding unit stresses 30 per cent. above live and dead load unit stresses.

24. *Bed Plates.* All bed plates shall be of such dimensions that the greatest pressure per square inch, due to any or all causes combined, upon stone masonry shall not exceed 300 pounds, and upon other masonry 250 pounds.

25. *Friction Rollers.* In no case shall the pressure per lineal inch of friction roller at expansion end of structures exceed 400 times the diameter of the roller in inches.

26. *Swing-Span Rollers.* The greatest pressure in pounds per lineal inch of face of rollers under swing-bridges shall not exceed, at rest 300 times, nor in motion 150 times the mean diameter of the roller in inches.

27. *Counter Systems.* Counter systems in all spans must, in addition to the requirements arising from the above loads and unit stresses, be designed to take care of a moving load 80 per cent. greater than that given in Art. 15, Clause "*c*," with an allowance of 80 per cent. increase in unit stress wherever such increases would cause heavier dimensioning or require additional counters.

28. *Lateral System.* Where lateral bracing consists of a double system of cancellation the lateral stresses shall be assumed to be equally divided between the two systems.

29. *Transverse Loads.* All horizontal or inclined members must be proportioned to sustain the combined stresses due to direct compression or tension and to the weight of the members and their transverse loads, but the combined unit stress from these causes must not exceed the unreduced direct unit stress by more than 10 per cent.

30. *Initial Stress.* All struts must be proportioned to resist the resultant due to an initial stress of 10,000 pounds on all rods attached to them whenever this is in excess of the maximum stress produced from other causes.

31. *"I" Beams.* All "I" beams shall be proportioned by their moment of inertia.

32. *Web and Flange.* No part of the web-plate shall be estimated as flange area in proportioning plate girders except that part included between the top flange angles of girders with double top flanges.

GENERAL DETAILS.

33. *Strength and Simplicity Required.* In general, strength and simplicity shall be the first considerations in design of any structure and any arrangement of members which introduces uncertainty or indeterminateness of stresses must be avoided.

34. *Types Preferred.* The types of bridges preferred are as follows:

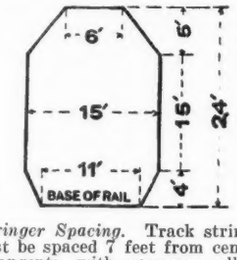
For spans up to 19 feet in length,—Rolled Beams.

For spans from 19 feet to 100 feet in length,—Plate Girders.

For spans from 100 feet to 150 feet in length,—Riveted Trusses with inclined end posts.

For spans of 150 feet and over in length,—Pin-Connected Trusses with inclined end posts.

35. *Clearance.* A clear section, as per accompanying diagram, must be provided for single track on tangent. The width must be increased so as to allow the same minimum clearance on curves and on double track.



36. *Stringer Spacing.* Track stringers, as a rule, must be spaced 7 feet from center to center on tangents, with necessary allowance on curves. Track stringers must be offset or shift-

ed laterally on curves so as to keep the center of the track approximately midway between the stringers.

37. *Girder Spacing.* Girders of deck-plate spans shall be spaced as follows, with necessary allowance on curves:

For lengths 60 feet and under, center to center of girders,—7 feet.

For lengths from 60 feet to 80 feet, center to center of girders,—8 feet.

For lengths from 80 feet to 100 feet, center to center of girders,—9 feet.

38. *Truss Spacing.* The trusses of single-track deck lattice spans shall be spaced as follows, with necessary allowance on curves:

For lengths from 100 feet to 110 feet, center to center of trusses,—10 feet.

For lengths from 110 feet to 130 feet, center to center of trusses,—12 feet.

For lengths from 130 feet to 150 feet, center to center of trusses,—14 feet.

The trusses of deck pin-connected spans shall be spaced as directed in each particular case.

39. *Through Girders.* Through plate girders shall conform to Articles 35 and 36.

40. *Friction Rollers.* All bridges over 75 feet in span shall have at one end segmental steel friction rollers not less than 6 inches in diameter, running between parallel planed surfaces; but cylindrical rollers 4 inches in diameter may be used when desired.

All bridges under 75 feet span shall be fixed at one end, and shall be free to move on plane surfaces at the other end.

41. *Pin Bearings.* All spans of over 75 feet shall have pine bearings at each end.

42. *Fixed End.* Where practicable the fixed end of a span must be as follows—letters indicating order of importance:

(*a*) At the end connecting with trestle approach.

(*b*) At one abutment.

(*c*) At the lowest pier.

(*d*) When the structure is on a grade, in the absence of other governing conditions, at the down grade end.

(*e*) In structures consisting of several spans, anchorages to be arranged so that no pier shall carry the fixed end of more than one span.

43. *Stiff Members.* All trusses of 6 panels or less shall have stiff members throughout built of plates and shapes with riveted connections.

44. Trusses over 150 feet span shall have stiff lower chords in the two end panels at each end.

45. Hip suspenders and long verticals shall be stiff members built of plates and shapes.

46. *Laterals.* Stiff members built of plates and shapes are required for both top and bottom lateral bracing of deck and through bridges. Where the details permit, the bracing must be connected to the lower flanges of stringers as well as to the lateral plates.

47. *Sway Bracing and Diaphragms.* In deck bridges there shall be transverse sway bracing at each panel point; the transverse bracing between the main inclined end-posts shall be sufficiently strong to transmit the accumulated upper chord wind pressure to the masonry. In deck-plate girders there shall be cross-frames (or diaphragms) not more than 16 feet apart, and at each end of each span.

48. *Viaduct.* Stiff members built of plates and shapes are required for both longitudinal and transverse bracing of viaduct towers.

49. *Tower Girders.* Tower girders shall be securely attached at each end to the tops of tower posts and provision made for expansion at one end of each intermediate span.

50. *Trestle Bents.* Trestle bents and viaduct towers must have lateral horizontal stiff members at top and bottom. Viaduct towers must have longitudinal horizontal stiff members at bottom. Bolts connecting girders to viaduct or trestle bents must have nuts and split keys.

51. *Floor Beams.* Unless the conditions forbid, floor beams shall be built into posts above or below the pin, and track stringers shall be built into floor beams.

52. *Portals, End Posts, Sway and Knee Bracing.* All through spans shall have portals at each end of the span, connected rigidly to the end posts, with the year of erection cut out of the portal plate, using Roman figures not less than 8 inches high. Portals shall be as deep as the specified head room will allow, and provision shall be made in the end posts for the bending stress produced by the wind pressure. Where head room will allow, all intermediate posts must have transverse sway bracing; where this is not admissible, efficient knee bracing must be provided. In through spans, where knee braces are used between the struts of the upper lateral system and the posts, provision must be made for a rigid connection between the posts and the upper chords.

Year Plate. To one plate girder of each pair, on the outside of web and as near the center as practicable, shall be riveted a small neat cast-iron plate with the year of erection only thereon in raised Roman figures 6 inches high. A similar plate shall be riveted to the upper surface of an inclined post at each end of each deck span.

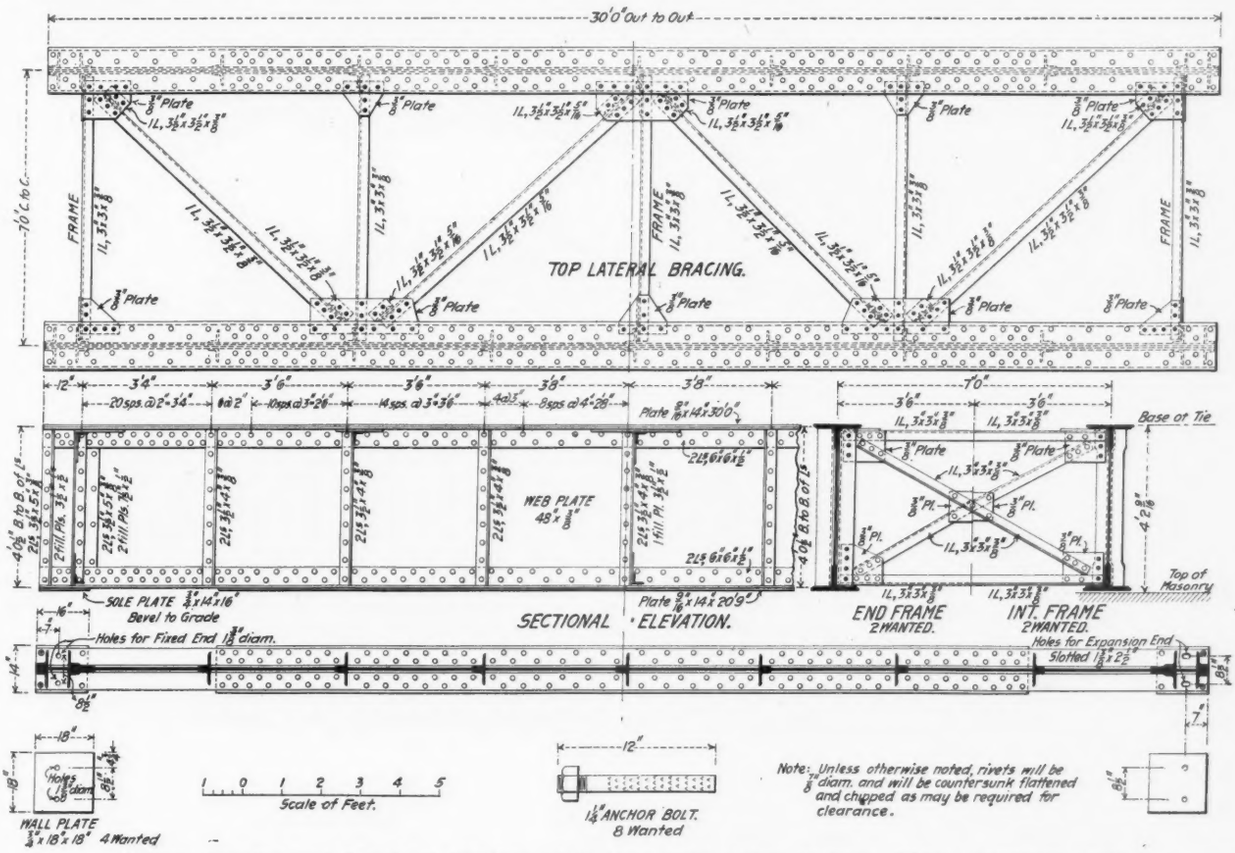
53. *Ties.* Ties shall be so gained over stringers, etc., that there will be no camber in the floor when there is no moving load upon the structure. The net depth of ties shall not be less than 7½ inches at center of span nor less than 9½ inches at ends of span; width of ties not less than 8 inches; spacing not more than 4 inches apart.

54. *Trestle Connections.* The supports or shelf angles under the ends of wooden trestle stringers connecting with steel spans, must be 8 inches wide (lengthwise with trestle stringer) and so constructed as to give a rigid bearing for this width and entirely across each group of trestle stringers.

55. *Camber.* The camber shall be at least one fifteen-hundredth of the span; the panel points of pin structures to be in the arc of a true circle.

56. *Minimum Section.* In no case shall any counter or diagonal rod have less area than three square inches.

57. *Upset Rods.* All rods with screw ends must be upset. The area at root of thread in upset ends shall be greater than the area of the rod by at least seventeen per cent. All turnbuckles must have lock nuts placed outside the turnbuckles.


30'0" Out to Out
70' C to C
TOP LATERAL BRACING.
FRAME
WEB PLATE 48"x⅜"
SECTIONAL ELEVATION.
END FRAME 2 WANTED.
INT. FRAME 2 WANTED.
Base of Tie
Top of Masonry
SOLE PLATE ¾"x14"x16" Bevel to Grade
Holes for Fixed End 1⅜" diam.
Holes for Expansion End Slotted 1⅜"x2½"
WALL PLATE ¾"x18"x18" 4 Wanted
1¼" ANCHOR BOLT. 8 Wanted
Scale of Feet.
Note: Unless otherwise noted, rivets will be ⅞" diam. and will be countersunk flattened and chipped as may be required for clearance.

General Drawing and Details of Standard 30-ft. Deck Plate Girder Railroad Bridge, Harriman Lines.

58. *Angle Connections.* Angles in tension shall be connected by both legs.

59. *Bed Plate.* When practicable, adjacent ends of consecutive spans shall have a common bed-plate. When the height of bed-plate exceeds 6 inches, separators must be introduced or other provision made to insure horizontal stiffness.

60. *Stiffeners.* Stiffeners must be used at intervals equal to the depth of girder or track stringer whenever the ratio of the unsupported depth of the web to its thickness exceeds fifty; also at points of concentrated loads. There shall be two pairs of stiffeners at the end bearings of girders, these four stiffeners to take care of the maximum end shear.

61. *Details.* Details must be so designed that all parts can be cleaned and painted, and should be 10 per cent. stronger than the main members connected by them. No closed columns or pockets will be allowed.

62. *Top Flange Area.* Top flange of built beams shall have the same gross area as bottom flange when of the same cross-section.

63. *Minimum Thickness.* No material less than five-sixteenths of an inch thick shall be used except for fillers, and no webs of girders or chords shall be less than three-eighths of an inch thick.

64. *Cover Plates.* Where two or more cover-

plates are used in the flanges of girders they shall be of equal thickness, or shall decrease in thickness outward from the angle; the cover-plate shall not extend more than 5 inches, or eight times the thickness of plate, beyond the outer line of rivets. In cover-plates more than 14 inches wide, four lines or rivets shall be used. Where practicable, the bottom cover-plate of the top flange must run the whole length of the girder.

65. *Rivet Pitch.* Pitch of rivets shall not be more than 6 inches nor more than sixteen times the thinnest plate connected, nor less than three times the diameter of rivets.

66. *Temperature.* Variations of 150 degrees Fahr. in temperature shall be provided for.

67. *Anchorage.* The roller end in every truss shall be free to move longitudinally under changes of temperature, but they must be securely anchored against lifting or moving sideways. The fixed end in every case shall be rigidly secured to the pedestal and the pedestal anchored to the masonry so that no motion can take place in any direction.

68. *Reaming.* Rivet holes of the following portions of the structure shall be punched to a diameter three-sixteenths of an inch smaller on the die side than the finished diameter of the hole, and shall be afterward reamed to a diameter one-sixteenth of an inch larger than that of the cold rivet:

(*a*) All tension members, except lateral and transverse bracing systems.

(*b*) Flanges, webs and all connections of floor systems.

(*c*) Flanges of all plate girders.

(*d*) Main compression members.

69. *Pin Projection.* The threaded ends of all pins must project at least one-fourth of an inch beyond the outside face of the nut.

70. *Members Straight.* All members must be straight between points of connection.

71. *Overhanging Beams.* No portion of a beam or girder intended to carry a moving load must extend beyond the supports. This does not apply to overhanging the beams when necessary in the turntable of swing spans.

72. *Pier Bents.* Pier bents of deck spans must be footed upon an extension of the lower chord and be at right angles to grade.

WORKMANSHIP.

73. *Workmanship.* All workmanship must be first-class in every respect.

74. *Finish.* All abutting surfaces of compression members, except flanges of plate girders which must be fully spliced, must be planed or turned so as to insure even bearings.

75. *Annealing.* In all cases where it is necessary to partially heat a steel member, the whole piece must be subsequently annealed.

76. *Limits of Error.* No piece having an error of one thirty-second of an inch between centers of pin holes, or one-fiftieth of an inch in the diameter of the pin or its hole, will be accepted.

77. *Built Members.* Built members, when finished, must be true and free from twists, kinks, buckles, or open joints between component parts.

78. *Rivet Holes.* Rivet holes must be accurately spaced and exactly opposite each other.

79. *Rivets.* Rivets must be of the best quality of rivet steel, must completely fill holes, and must have full heads. Rivets for field work must have full and perfect heads, with underside of head square to shank; shanks must be of a uniform circular section throughout and cut square at end, and must be free from projections or imperfections which would prevent the head from fitting closely before rivet is driven.

80. *Eye-Bars* Eye-bars shall be die forged without welds.

81. *Painting in Shop.* All surfaces inaccessible after assembling must be painted with a good quality of red lead paint before the parts are assembled. After work is finished at the shops, it shall be cleaned of all loose scale and rust, and thoroughly and evenly covered with one coat of red lead paint before shipping. All planed or turned surfaces must be coated with white lead and tallow.

82. *Blocking.* Projecting members, liable to be bent or injured in transit, must be blocked with wood before shipment, in such a way as to protect them from injury in handling.

83. *Straightening Material.* All material must be thoroughly straightened before being laid off or worked in any way.

84. *Fillets.* No sharp unfilleted angle will be allowed anywhere, and whenever plate or shape has been cut into, the fillets as well as the cut must be finished so that no sign of the punched or sheared edge remains.

85. *Rivet Holes.* In punched work the diameter of the die shall not be more than one-sixteenth of an inch greater than the diameter of the punch.

86. *Assembling.* Riveted members must have all parts well pinned up and drawn together before riveting up, so that when finished they will be free from open joints and the component parts will lie close on each other.

87. *Machine Driven Rivets.* All rivets must be driven by machine where possible, and where not possible pneumatic driven rivets will be preferred to hand rivets.

88. *Reaming Connections.* Wherever practicable, reaming must be done after all pieces which are to be fastened together by the same rivets have been assembled. If necessary to take the pieces apart for shipping or handling, the respective pieces reamed together must be so marked that they may be reassmbled in the final setting up. No interchanging of pieces after reaming will be allowed.

All spliced members shall be put together in the shop, and the field rivet holes reamed to a fit while these members with their splice plates are in place. All spliced chord sections or trestle columns must be assembled and strung out in the shop in lengths of not less than three sections, and after being drawn up into contact at the joints and lined up perfectly with splice plates in place, the field rivet holes shall be reamed to a fit before taking apart, and the assembled parts with their splice plates shall be matchmarked so that they may be reassembled in the final setting up.

All field connections in the floor system must be reamed to a fit while the members are assembled in the shop, or to an accurate steel template not less than one inch thick.

89. *Milling.* All floor beams and track stringers must be milled on both ends to correct length, and end connection angles must be accurately fitted so that not more than one-sixteenth of an inch will be taken off of these connection angles at their roots.

90. *Stiffeners.* All stiffeners must have a tight fit between upper and lower flanges of girders.

91. *Inspection.* No material shall be rolled or work done before the Railroad Company has been notified where the orders have been placed and arrangements have been made for the inspection.

92. Complete copies of mill orders and plans must be furnished to the inspector, and he must be notified in time to be on hand when work is begun on his orders.

93. The contractor must furnish all facilities for inspecting the workmanship and testing the quality of all material furnished on the order at the mill or shop where the material is manufactured.

94. The inspector must be given reasonable facilities to check the weights of finished members before shipment. Not more than 2½ per cent. excess weight over figured weight will be paid for by the Railroad Company.

95. *Turned Bolts.* Wherever bolts are used in place of rivets the holes must be reamed true to size after work is assembled, the bolts must be turned to a driving fit and their threads reduced one-eighth of an inch in diameter under size of finished bolts. A small washer, one-eighth of an inch thick, must be used under nut.

96. *Pilot and Driving Nuts.* At least one pilot and driving nut must be furnished with every twenty pins or less of one size for every size of pin.

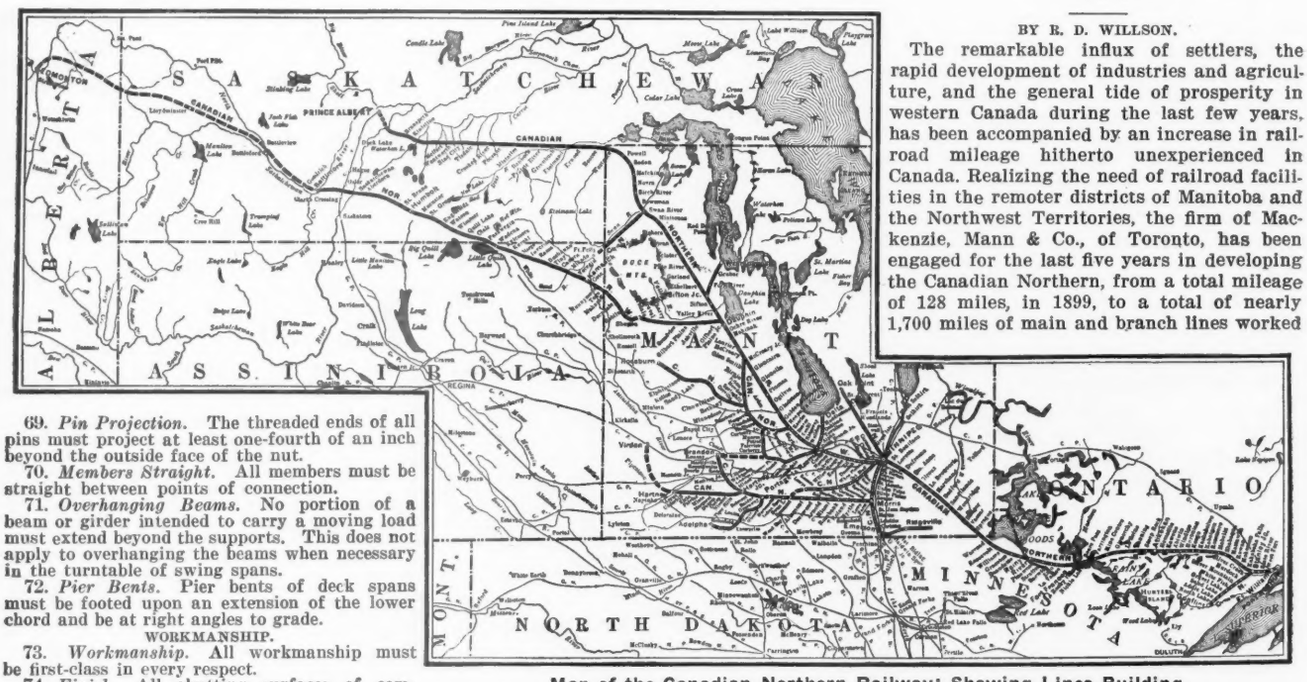
FINAL TEST.

97. *Test.* The completed bridge when tested by a train moving at the rate of 60 miles an hour shall not deflect more than one fifteen-hundredth of its span, and must return to its original camber after the passage of the train.

The Canadian Northern Railway in the West.

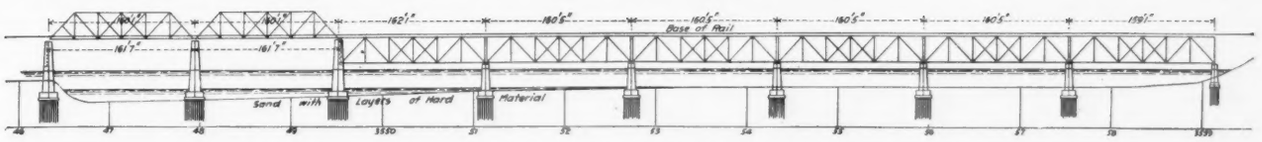
BY R. D. WILLSON.

The remarkable influx of settlers, the rapid development of industries and agriculture, and the general tide of prosperity in western Canada during the last few years, has been accompanied by an increase in railroad mileage hitherto unexperienced in Canada. Realizing the need of railroad facilities in the remoter districts of Manitoba and the Northwest Territories, the firm of Mackenzie, Mann & Co., of Toronto, has been engaged for the last five years in developing the Canadian Northern, from a total mileage of 128 miles, in 1899, to a total of nearly 1,700 miles of main and branch lines worked at the present time, besides over 400 miles of track not yet taken over by the operating department.



Map of the Canadian Northern Railway; Showing Lines Building.

Starting with the present eastern terminus at Port Arthur, the head of navigation on the Great Lakes, the Canadian Northern runs, with general direction almost due west, through the iron and mineral region of the Mattawin and Atikokan ranges, which have hitherto lain dormant solely by reason of the lack of shipping facilities. A company has recently been formed, which intends erecting large smelters and ore docks at Port Arthur, and it is expected that the fall of 1905 will see these furnaces in working order and ore being shipped from this point. Leaving the mineral country the line passes through Fort Frances, where there is abundant water power, and on to the town of Rainy River (1,500 inhabitants), through the fertile Rainy River district, which contains some 800,000 acres of good arable land in addition to a large acreage of grazing land. From this town, where there are two large lumber mills, the road crosses the Rainy Lake

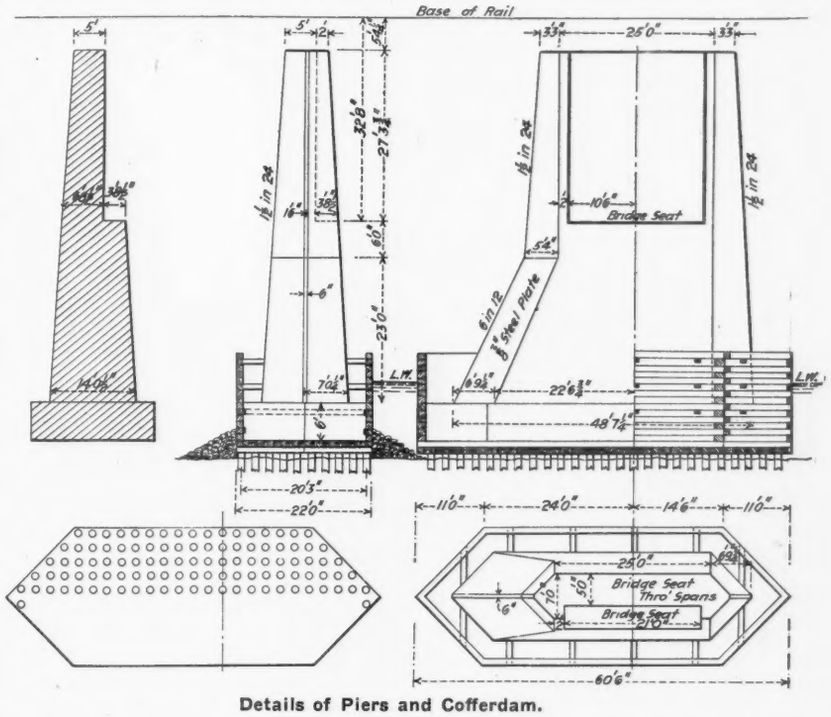


General Elevation of Bridge at Mile 515—First Crossing of North Branch of the Saskatchewan.

river into Minnesota, and then runs in a northwesterly direction to Winnipeg. Winnipeg is the converging point for most of the branches in Manitoba, and here it is the intention to build during the coming season a large hotel and passenger station, car shops, locomotive repair and erecting shops and terminal yards capable of accommodating a rapidly growing traffic.

From Winnipeg, the road runs westerly and northwesterly through Portage la Prairie and Gladstone to Dauphin. Here the line forks, one line running northerly and westerly through the Swan River valley, Erwood, Melfort and the Carrot river country towards Prince Albert; the other turning due west through the pass between the Duck and Riding mountains, thence almost in a direct line through the Quill plains, Saskatchewan valley, Battleford, and Lloydminster to Edmonton, N. W. T. This latter line will be the main line. Mr. Thos. Turnbull, in his report to the Canadian Minister of the Interior, says, "With reference to the country as a whole through which the Canadian Northern passes, in my opinion it will pass through more good land immediately tributary to it than any other line which could be projected from any other point on the Manitoba boundary, assuming that a railroad line will serve a strip of country 20 miles on each side of the line."

In November, 1901, Mr. John Armstrong, one of the company's engineers, made a reconnaisance trip from Edmonton to Prince Albert by way of Battleford with a view to locating the main line between those points, continuing what is now the Prince Albert branch. His reports of the country to be served and the ease with which a line could be built were so satisfactory that preliminary surveys were made during the winter of 1901 and 1902, and a preliminary location laid down during the late winter and early spring of 1902. The eastern objective point was, however, changed from Prince Albert to Grandview, which was at that time the terminus of the Gilbert Plains branch. Practically an air line was secured between these points, the general direction being about 20 deg. north of west. The curvature was limited to 6 deg. and the maximum grade eastbound limited to one-half of 1 per cent. Heavier grades were used westbound, but the majority of these have since been eliminated, so that the ruling grade in either direction does not exceed 26.4 ft. per mile. Some difficulty was experienced in obtaining a satisfactory line conforming with these conditions through the pass west of Grandview, there being several extremely heavy stream crossings which it was necessary to take with the least possible initial expenditure.



Details of Piers and Cofferdam.

Work was started on this portion in May, 1902, when Messrs. George H. Strevel & Son completed 35 miles of the heaviest piece of work on the line. The quantities on this first 35 miles averaged over 18,000 yds. per mile, 10 per cent. of which was loose rock or hardpan. The Doukhobors, who have large settlements in the Swan river and Yorkton districts, were put to good use in the parts where station work was done. These men make good workers and will put up from 12 to 15 yds. per day per man, the prices paid them varying from 18 cents to 20 cents for earth. No track was laid west of Grandview during 1902.

During the season of 1903 Messrs. Strevels' outfit was again at work, and another outfit of about the same size belonging to The MacDonald-McMillan Company, Ltd., of Westbourne, Man., was awarded a large contract. During this season 80 miles of grade was built west of the end of the previous season's work. Other than a couple of "New Era" graders used by the MacDonald-McMillan firm, no excavating nor grading machinery was used on this part of the work. The quantities moved on this part of the line during the whole season totaled about 1,500,000 yds., of which fully 25 per cent. was loose rock or hardpan. While these two contractors were working from the east end, another large outfit belonging to Mr. J. D. McArthur, of Winnipeg, started in at the crossing of the South Saskatchewan river and worked east.

South Saskatchewan Bridge, Showing Temporary Bridge to Pass Trains.

Mr. McArthur's outfit consisted of about 130 teams and teamsters, and from 50 to 100 men additional. On one large cut containing about 60,000 yds. the material was removed in dump cars, but outside of this no grading machinery was used. Another small outfit belonging to McCutcheon & Fisher, of Winnipeg, was put to work about midway between the larger outfits. McArthur's work was fairly heavy, running about 15,000 yds. to the mile. Great difficulty was experienced in getting supplies to the different camps during this season. Freight had to be teamed in many cases from 50 to 100 miles. During the season of 1903 150 miles of grade and 92½ miles of track were completed on the main line west of Grandview.

Bridging along the line was done by the bridge department of Mackenzie, Mann & Company, under the direction of Mr. J.

Weller. This consisted mainly of pile and timber trestles, of which there were a large number, owing to the rough nature of the country west of Grandview. Several of these trestles are from 50 to 80 ft. high and up to a quarter of a mile long.

During the season (1903) work was commenced on the first of the four crossings of the Saskatchewan river. It is a steel deck bridge with six 180-ft. spans, giving a total length of steel-work of 1,080 ft., with trestle approaches amounting to 555 ft. The piers are of concrete resting on piles cut off below low water and driven to a hard bottom. The noses of the piers are protected from the ice and drift material by a covering of ⅜-in. steel plates, secured to them by bolts screwed into the plates from the inside and riveted after the concrete has set. From the top of the footings to the top of piers is 51 ft. and to base of rail is 87 ft. 9 in. This substructure was commenced in 1903, but owing to difficulty with the foundations it could not be completed during that year. Owing to the severity of the spring ice-run, the temporary timber-work had all to be removed before the spring freshets of 1904, and replaced for the completion of the piers and the erection of the steel-work. The substructure work was done by Mackenzie, Mann & Company, and the superstructure by the Canadian Bridge Company, of Walkerville, Ontario. The total weight of steel in the bridge is 1,944,750 lbs.

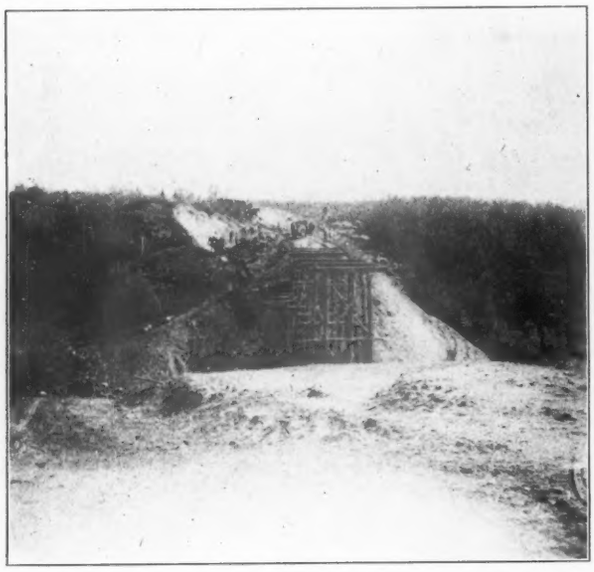
During the past season (1904) a determined effort was made to push the line through to Edmonton, a distance of 827 miles from Winnipeg, necessitating the building of 505 miles of grade and the laying of 527 miles of track, not including sidings, divisional yards, etc. The MacDonald-McMillan Co. was commissioned to complete from the end of its previous season's work at mile 322 to the east end of McArthur's contract at mile 410. J. D. McArthur, of Winnipeg, was awarded the contract for the rest of the grading, amounting in all to about 370 miles, including the heavy river approaches at The Elbow and at Battleford. The contract for track laying and bridging (exclusive of steel structures) was given to S. R. H. Robinson, of St. Louis. Work was also begun on the substructure of the second Saskatchewan river crossing at The Elbow at mile 515. Owing, however, to the difficulty in securing suitable labor progress was slower than anticipated and the end of the grading season saw the end of the continuous grade 125 miles east of Edmonton, and the track held up at The Elbow awaiting the erection of a temporary bridge at that point. But a good season's work was done, the total mileage graded on the main line amounting to 291.8 miles, with track laid to 214.9 miles, exclusive of side-tracks and yards; this is in addition to the numerous branch lines building in Manitoba and the Northwest Territories. As this line passes through a new country, and railroad communication is very limited, supplies, etc., for the grading outfits had to be teamed long distances, adding to the difficulty in making rapid progress.

The roadbed is substantial, being 16 ft. wide on top of the embankment and 22 ft. in cuttings. Ties, mostly tamarack, hauled from 600 to 800 miles from Ontario and Saskatchewan (Prince Albert branch), are laid 2,640 to the mile. Sixty-lb. rails are laid throughout. Sidings are placed from six to eight miles apart according to the nature of the country and the prospective traffic. These are generally 2,000 ft. between head blocks and provide for a passing track 15 ft. out and an elevator track 45 ft. or 60 ft. out from the main line. Divisional points, consisting at present of about three miles of side-tracks, roundhouse, turntable and tank (60,000 gal.), are established about 125 miles apart. Substantial stations costing about $2,000 have been erected at every second siding, or oftener if conditions warranted it, and water tanks of 40,000 gals. capacity, on concrete foundations, are placed at intervals of 18 or 20 miles, generally at or near a siding. Station buildings at divisional points are larger than intermediate ones and cost in the neighborhood of $5,000. Freight was accepted over this line as far as Humboldt, mile 425, and carried through by construction trains as soon as the track was laid. New towns have sprung up at almost every siding, showing that a profitable business awaits the completion of the line.

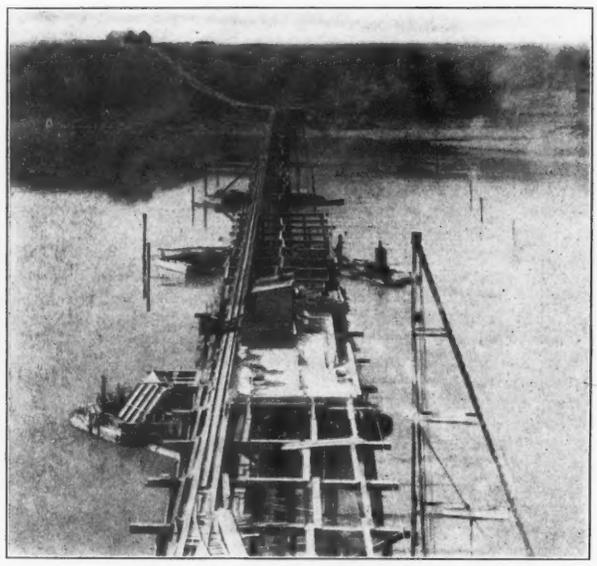
The second crossing of the Saskatchewan river, or more properly the first crossing of the North branch, is at The Elbow at mile 515. The substructure of this bridge is now well under way, and steel erection has begun. The main bridge consists of six 160-ft. deck spans and two 160-ft. through spans over the river channel proper. These rest on concrete piers and abutments, built similarly to those at the crossing of the South branch at mile 485. The height of piers for deck spans is 38 ft. and the base of rail is 33 ft. above top of piers. Smith concrete mixers have been used on both of these bridges. Mackenzie, Mann & Co. are doing the concrete work, and the Canadian Bridge Co. has the contract for the erection of the steel-work.

A third bridge has recently been started near Battleford at mile 577. This is the longest steel bridge on the line, and consists of nine 170-ft. deck spans and two 170-ft. through spans. The foundations will be similar to those of the two bridges already mentioned. Mackenzie, Mann & Co. will build the substructure and the Canada Foundry Co., of Toronto, will erect the steel-work. A fourth bridge will cross the Saskatchewan river at Fort Saskatchewan, mile 810, which will be similar in size to the one at mile 485. These four bridges cost over $1,000,000.

It is expected that track laying will reach Edmonton about next August.



Heavy Fill West of Grandview, Canadian Northern.



First Stage of Falsework, South Saskatchewan Crossing.

The Effect of Oil Upon Portland Cement Concrete.

About two years ago (Jan., 1903), it was accidentally discovered in the cement testing laboratory of the Chicago, Milwaukee & St. Paul Railway, which is under the supervision of Mr. C. F. Loweth, Engineer and Superintendent of Bridges and Buildings, that oil distintegrates Portland cement. Briefly the circumstances were as follows: A two-year-old neat Portland cement briquette, which had been in use in the laboratory as a paper weight, was laid aside where it was exposed to occasional drippings of signal oil. In ten months the briquette began to disintegrate. Fig. 1 shows the effect after being exposed as above for that period.

Before that time there was considerable difference of opinion in regard to the effect of oil on concrete; in fact, there is to-day. Many consider it entirely harmless, and to prove their assertions call attention to machinery foundations in use for many years, which, though exposed to waste oil, are perfectly sound. On the other hand, there are many who believe the contrary to be true, and cite cases of concrete disintegrating where oil appeared to be the sole cause. The laboratory discovery above referred to proved clearly that oil must have a powerful effect on concrete mortar, to disintegrate a two-

Fig. 1.

Briquette disintegrated by signal oil. Three years old, neat Portland cement. Oil applied for 10 months.

year-old briquette. It therefore seemed important to make further investigations, because concrete is used extensively in places where waste oil cannot be avoided, such as engine and machine foundations, turntable and roundhouse pits, drawbridge piers and abutments, floors in oil storage houses, etc. The discovery referred to indicates that concrete when used where oil can reach it may disintegrate in time, with serious results. Investigation was accordingly begun under the direction of Mr. J. C. Hain, Engineer of Masonry Construction, and an examination was made of many concrete structures on which more or less oil was found. There were a limited number of instances where the concrete possibly was affected by oil. In these cases, however, the concrete was very old, and the character of the original material and the workmanship was questionable. On the other hand, none which was fairly new and known to be of good quality, was affected to any perceptible degree, if at all. One case which particularly attracted attention, was the concrete floor of an oil house in which lubricating and lighting oils had been stored for six years without any apparent effect. The penetration of the oil was slight, perhaps not to exceed 1/16 in. Moreover, the saturated portion seemed to be as sound as the rest. There were other cases where the oil had penetrated deeper. For example, in the pits of a roundhouse, the oil had gone in from ¼ in. to ½ in. In other respects, the concrete seemed perfectly sound. These pits, however, had been in use only about a year when examined. It will thus be seen the observations of concrete structures proved nothing definite. While the investigation seemed favorable for the structures examined, it could not be taken as conclusive for all concrete structures.

It was then decided to make laboratory experiments. These tests were made on Portland cement briquettes, made of neat cement, 1:3 of sand and 1:3 of limestone screenings, which were allowed to age four days in the laboratory air, and were then subjected to applications of signal oil. (See First Series, Table 1.) At first, small quantities of oil (enough to saturate) were applied daily. Later, the applications were less frequent, depending upon the amount the briquette absorbed. Cracks developed in the sand and limestone briquettes first. They appeared in these at the age of two and a half months. The neat briquettes showed similar results in five months. A sand briquette of the same series is shown in Fig. 3, at the age of six months, when larger cracks had developed. Fig. 4 is the same briquette after crushing in the hand, thus showing the disintegration to be complete. All briquettes eventually disintegrated.

After being convinced of the results of the above, a still more extensive series was started. Previously, tests were confined to signal oil and one kind of cement. This second series (see Table 1), included tests of a characteristic oil or fat from each of five different groups which are most common, and one each of the three varieties of cement which were classed according to the raw material from which each was made. The oils and fats used were as follows:

Class.	Kind.
Animal fat	Extract of lard.
Animal oil	Whole.
Vegetable oil:	
Semi-drying	Castor.
Drying	Boiled linseed.
Mineral	Crude petroleum

In addition to these, signal oil, which is a mixture of animal fat and mineral oil, was also used because it served for a comparison to the previous tests. In choosing the cement, a well-known brand of Portland cement was selected from those made from stone and clay, another from marl and clay, and a third from slag and stone.

Fig. 3.

Disintegrated by signal oil and crumbled in hand. Six months old. Portland cement sand, 1:3. Four days old in air when oil was applied.

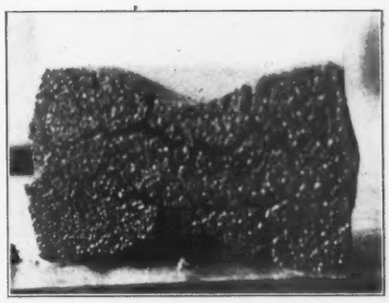


Fig. 2.

Disintegrated by signal oil. Six months old. Portland cement and sand, 1:3. Four days old in air when oil was applied.

Neat and 1:3 sand briquettes from all these varieties of cement were then made, and each was treated with the six different kinds of oils and fats. A total of about 800 briquettes were required to cover the entire series of tests (including those made for comparison but not treated with oil). All briquettes were left in the laboratory air seven days before starting the oil treatment which was similar to that used in the former test. The oil applications were continued until the tests ended, or nine months after they were started. Tensile tests were obtained of the oil-treated briquettes and also (for comparison) of two similar sets without oil, one of which was kept in water, and the other in laboratory air. The briquettes were broken at 28 days, three, six and nine months, except when disintegration prevented.

The results of the tensile tests are not reproduced. All other results are shown in Series II, of Table I. It will suffice to discuss the most important features. The greatest effect was caused by animal fat or extract of lard oil. It disintegrated most of the neat and sand briquettes in from one-half to two and one-half months. However, it failed to destroy some, even at the end of nine months, when the tests were discontinued. As a rule, the neat briquettes were affected first, which was contrary to what was noticed in the first series of tests. Figs. 6 and 7 show the results of the lard oil treatment on the nine-months-old briquettes of the slag and stone and marl and clay varie-

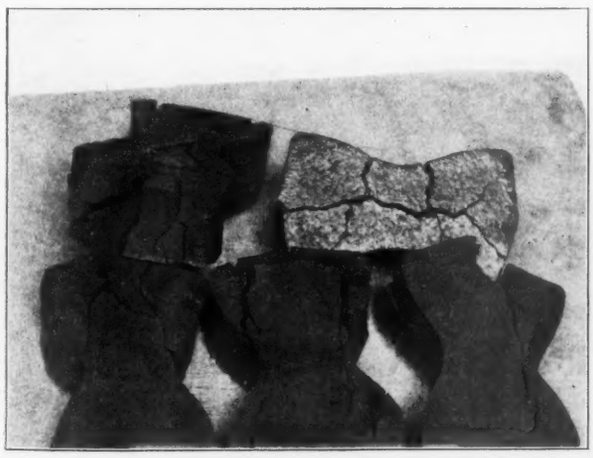


Fig. 4.

Disintegrated by extract of lard oil after nine months. Portland cement (marl and clay), neat and sand briquettes. Seven days old in air before oil was applied. Began failing in two months.

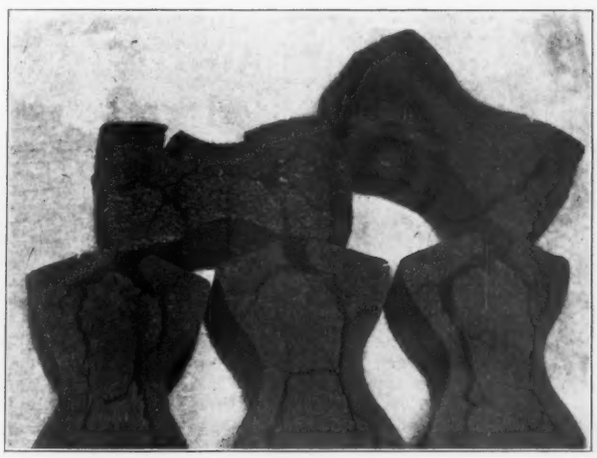


Fig. 5.

Disintegrated by extract of lard oil after nine months. Portland cement (slag and stone), neat and sand briquettes. Seven days old in air before oil was applied. Began failing in one month.

ties of cement. The stone-clay class was disintegrated the least and the slag-stone the most. The above order of disintegration, however, was not followed in all cases. In this connection, it is well to say that the materials out of which a cement is made do not seem to govern the effect of the oil; instead the peculiar characteristics of each cement apparently regulate that. Next in effect was signal oil—a mixture of animal fat and mineral oil. It acted only slightly differently from the extract of lard. Following this were the whale and castor oils. They caused considerably less disintegration than either of the two oils before mentioned. Only a small percentage of the briquettes treated with these oils were affected in outward appearance up to the end of the test. The two remaining oils, petroleum and boiled linseed, did not disintegrate any of the briquettes up to nine months. Petroleum, however, penetrated and affected the strength somewhat, and possibly would have destroyed the briquettes eventually, while boiled linseed formed a coating without penetrating. Of the five classes, boiled linseed was the only one that apparently did not affect the strength of the briquettes. This no doubt was due to oxidation which prevented it from soaking in. Had it not dried before penetrating, it possibly would have disintegrated the briquette to the same degree as castor oil, the other vegetable oil used.

The first two series of tests showed the effect of oil on the weaker briquettes. The term weaker is used because it will be remembered that the first series of tests, which consisted of only a few, were treated with oil when four days old, and the second series were treated after seven days; also that these were not regularly cured briquettes, but were exposed to the laboratory air instead of water after making. This method was used to allow the briquettes to dry so that they would more readily absorb the oil. Therefore, their age when the oil was first applied, and the method of curing naturally made these briquettes more susceptible to oil than if they were older and cured in water. This was intentional, in order to make the effect of the oil treatment more pronounced. To supplement the tests on these weaker briquettes, experiments were made with older specimens which were cured according to the regular laboratory practice. Some of these tests follow:

A neat, a 1:1, a 1:2 and a 1:3 sand briquette, all of which were two years old, were dried at the stove for twenty days and then treated with signal oil. It has been prac-

Table I.—Effect of Oil on Portland Cement Briquettes.

Date made. Mo.	Date made. Yr.	Class of Portland cement.	Briquettes (Portland cement).	Method of curing briquette. In water.	In laboratory air.	Dried warm air.	Oil applications. Age when started.	Time applied to date.§	Extract lard oil. No. briq. made.	Extract lard oil. Time applied before disintegrated.	Whale oil. No. briq. made.	Whale oil. Time applied before disintegrated.	Castor oil. No. briq. made	Castor oil. Time applied before disintegrated.	Linseed oil (boiled). No. briq. made.	Linseed oil (boiled). Time applied before disintegrated.	Petroleum oil, crude. No. briq. made.	Petroleum oil, crude. Time applied before disintegrated.	Signal oil. No. briq. made.	Signal oil. Time applied before disintegrated.
Original Discovery.																				
Jan.,	'00.	Stone & clay	Neat.	.....	2 yrs.	.....	2 yrs.	.....	..	.....	..	.....	..	.....	..	.....	..	.....	1	10 mos.
Aged Briquettes—Regular Treatment.																				
Feb.,	'01.	Silica cement‡	Neat.	2 yrs.	.....	20 dys.	2 yrs.	2 years.	..	.....	..	.....	..	.....	..	.....	..	.....	1	Sound.
			1 to 1	2 "	.....	20 "	2 "	2 "	..	.....	..	.....	..	.....	..	.....	..	.....	1	"
			1 to 2	2 "	.....	20 "	2 "	2 "	..	.....	..	.....	..	.....	..	.....	..	.....	1	"
			1 to 3	2 "	.....	20 "	2 "	.....	..	.....	..	.....	..	.....	..	.....	..	.....	1	2 years
Odd Tests.																				
Sept.,	'02.	Stone & clay	Neat.	28 dys.	3 mos.	.....	4 mos	.....	..	.....	..	.....	..	.....	..	.....	..	.....	1	8 mos.
Feb.,	'03.	Marl & clay	Neat.	.....	1 mo.	.....	1 mo.	.....	..	.....	..	.....	..	.....	..	.....	..	.....	1	6 "
First Series.																				
Mar.,	'03.	Stone & clay	Neat.	.....	4 dys.	.....	4 dys.	.....	..	.....	..	.....	..	.....	..	.....	..	.....	18	5 mos.
Mar.,	'03.	" & "	1:3 sand.	.....	4 "	.....	4 "	.....	..	.....	..	.....	..	.....	..	.....	..	.....	18	2½ "
Mar.,	'03.	" & "	1:3†	.....	4 "	.....	4 "	.....	..	.....	..	.....	..	.....	..	.....	..	.....	18	2½ "
Second Series.																				
Jan.,	'04.	Stone & clay	Neat.	.....	7 "	.....	7 dys.	.....	18	3 mos.	18	9 mos.*	18	9 mos.*	18	9 mos.*	18	9 mos.*	18	9 mos.*
Jan.,	'04.	Stone & "	1:3 sand.	.....	7 "	.....	7 "	9 mos.	12	9 " *	12	9 " *	12	9 " *	12	9 " *	12	9 " *	12	9 " *
Jan.,	'04.	Marl & "	Neat.	.....	7 "	.....	7 "	.....	18	2⅔ "	18	9 " *	18	9 " *	18	9 " *	18	9 " *	18	6 "
Jan.,	'04.	Marl & "	1:3 sand.	.....	7 "	.....	7 "	9 mos.	12	9 " *	12	9 " *	12	9 " *	12	9 " *	12	9 " *	12	9 " *
Jan.,	'04.	Slag & stone	Neat.	.....	7 "	.....	7 "	.....	18	1 "	18	3 "	18	4 "	18	9 " *	18	9 " *	18	1¼ "
Jan.,	'04.	Slag & stone	1:3 sand.	.....	7 "	.....	7 "	.....	12	7 "	12	4¼ "	12	6½ "	12	9 " *	12	9 " *	12	4 " *
Grand total, briquettes.....600				Total briquettes.....90					90		90		90		90		90		150	

*Sound after applying oil 9 months at which time tests were discontinued.
†Limestone screenings.
‡Made by grinding together equal parts of cement (sand and clay glass) and sand.
§Where not disintegrated.

Table II.—Effect of Signal Oil and Extract of Lard Oil on Portland Cement Briquettes Treated to Preserve Them.

Date made. Mo.	Date made. Yr.	Class of Portland cement.	Method of curing briquettes. In laboratory air.	In damp air.	In water.	Dried in warm air.	Time treated with preservative.	Oil applications. Age when st'rted.	Time applied to present date.	Signal oil. Neat briq. No. briq. made	Signal oil. Neat briq. Time applied before disintegrated.	Signal oil. 1:3 sand briq. No. briq. made	Signal oil. 1:3 sand briq. Time applied before disintegrated.	Extract of lard oil. Neat briq. No. briq. made	Extract of lard oil. Neat briq. Time applied before disintegrated.	Extract of lard oil. 1:3 sand briq. No. briq. made	Extract of lard oil. 1:3 sand briq. Time applied before disintegrated.
Sylvester's Proccss I.—5 per cent. alum and 7 per cent. soap solution; 5 coats—began dissolving in 15 days.																	
June,	1903.	Stone and clay	.....	.....	1 yr.	14 dys.	1 day.	1 1/24 y.	9 mos.	1	Sound.	1	Sound.	1	Sound.	1	Sound.
Regular briquettes to accompany above.																	
June,	1903.	Stone and clay	.....	.....	1 yr.	14 dys.	1 day.	1 1/24 y.	9 mos.	1	Sound.	1	Sound.	1	Sound.	1	Sound.
Linsced Oil—This oil oxidized and formed a hard coating—above oils dissolved coat.																	
Jan.,	1904.	Stone and clay	6 mos.	.....	.....	.....	6 mos.	6 mos.	8 mos.	1	Sound.	1	Sound.	1	Sound.	1	Sound.
Jan.,	1904.	Marl and clay	6 "	.....	.....	.....	6 "	6 "	8 "	1	"	1	"	1	"	1	"
Jan.,	1904.	Slag and stone	6 "	.....	.....	.....	6 "	6 "	8 "	1	2 mos.	1	"	1	2 mos.	1	"
Sylvester's Process II.—Briquettes made up with 5 per cent. alum and 7 per cent soap solution instead of water.																	
June,	1904.	Marl and clay	7 days.	7 days.	.....	.....	.....	14 dys.	.....	3	4 mos.	3	5 mos.	3	45 dys.	3	38 dys.
Regular briquettes to accompany above.																	
June,	1904.	Marl and clay	7 days.	7 days.	.....	.....	.....	14 dys.	.....	3	1½ "	3	1½ "	3	15 "	3	20 "
Paraffine I.—Applied hot to cold briquette—Coated only—Oils dissolved coating in 1½ Months.																	
Sept.,	1904.	Stone and clay	14 dys.	.....	14 dys.	.....	1 day.	28 dys.	4 mos.	1	Sound.	1	2 mos.	1	Sound.	1	2 mos.
Sept.,	1904.	Marl and clay	14 "	.....	14 "	.....	1 "	28 "	4 "	1	"	1	2 "	1	"	1	2 "
Sept.,	1904.	Slag and stone	14 "	.....	14 "	.....	1 "	28 "	4 "	1	"	1	2 "	1	"	1	2 "
Paraffine II.—Applied hot to heated briquette—Penetrated ⅛-in. Oil dissolved paraffine in 1½ Months.																	
Sept.,	1904.	Stone and clay	14 dys.	.....	14 dys.	.....	1 day.	28 dys.	4 mos.	1	Sound.	1	2 mos.	1	Sound.	1	2 mos.
Sept.,	1904.	Marl and clay	14 "	.....	14 "	.....	1 "	28 "	4 "	1	"	1	2 "	1	"	1	2 "
Sept.,	1904.	Slag and stone	14 "	.....	14 "	.....	1 "	28 "	4 "	1	"	1	2 "	1	"	1	2 "
Sodium Silicate—Oils dissolved sodium silicate coating in 20 Days.																	
Dec.,	1904.	Stone and clay	14 dys.	7 days.	.....	.....	7 dys.	21 dys.	1½ m.	1	Sound.	1	Sound.	1	Sound.	1	Sound.
Dec.,	1904.	Slag and stone	14 dys.	7 days.	.....	.....	7 dys.	21 dys.	1½ m.	1	"	1	"	1	43 dys.	1	"
Regular briquettes to accompany above.																	
Dec.,	1904.	Stone and clay	14 dys.	7 days.	.....	.....	7 dys.	21 dys.	1½ m.	1	Sound.	1	Sound.	1	Sound.	1	Sound.
Dec.,	1904.	Slag and stone	14 dys.	7 days.	.....	.....	7 dys.	21 dys.	1½ m.	1	"	1	"	1	43 dys.	1	25 dys.
Grand total, briquettes..... 84.							Total briquettes			21		21		21		21	

tically two years since the oil was first applied. With one exception they show no signs of disintegration, and in this it was only barely noticeable. The above briquettes were made of silica cement instead of regular Portland, which consisted of equal portions of sand and Portland cement, ground together to a fineness that passed through a No. 200 sieve. In other words, these briquettes are weaker than the standard Portland cement briquettes of the same mixture. The one that failed was the weakest of the four, being a mixture of 1 of silica cement to 3 of sand. Again, a neat and a 1:3 sand briquette were taken from the vat at the age of one year and treated with signal oil. They appear to be perfectly sound, though soaked in oil for practically one year. Still another specimen was a 28-day neat briquette which was dried by exposing to laboratory air for three months. Signal oil was then applied and at the age of eight months the briquette was disintegrated. Eight one-year-old briquettes were also included in this series. They are sound; but, however, they were immersed in oil only nine months, and moreover were otherwise treated to prevent the action of the oil. (These will be spoken of later.) In connection with this series of tests of older briquettes, it may be well to add that experiments are being made with a piece of concrete from the oil house floor before mentioned, which, though in use for six years, was not perceptibly affected. This piece of concrete has now been immersed in oil for ten months, and is still sound. It will thus be seen that only two briquettes out of the long-time series of 15, failed, both of which were the weakest in the lot. One of these was 28 days old when taken from the vat, which if it was an average briquette, would have broken at from three-quarters to seven-eighths of its ultimate strength. The other, while set for two years in water, was a comparatively lean mixture, being made of 1 part of silica cement and 3 parts of sand. (This briquette would have broken at from three-quarters to seven-eighths of the strength of a 1:3 regular Portland test piece.) The specimen of concrete and the rest of the briquettes show no signs of failure. However, the oil has penetrated throughout, and also possibly has weakened them.

Thus far, the investigation may be summarized briefly as follows: At the outset no specimen of concrete was found that could be said to have been positively disintegrated by oil, though not infrequently cases were heard of; for example, the pedestal under a cream separator, which case seemed possible because it is an instance of almost continued application of animal fat and apparently the worst condition that could exist. On the other hand, plenty of concrete was found that oil had penetrated but not disintegrated. Further, the tests of comparatively new briquettes, which were weakened by exposure to air, showed that with one exception, they were disintegrated by all classes of oils and fats. These oils and fats, when arranged in the order of their effect (as far as the experiments indicate) are as follows: Animal fat, animal oil, vegetable oil and mineral oil. The exception to the above was the drying vegetable oil, which, unlike the semi-drying vegetable oil oxidized before penetrating. It was apparently the only one which had no effect. In these tests animal fat had a much greater effect than the oils. Only a small percentage of the briquettes were disintegrated at the end of the tests, or nine months after the first application by the oils which contained no fat. (The tests are not extensive enough to say whether the above arrangement of the classification of fats and oils according to their effect on briquettes would hold true if other oils had been experimented with, because their chemical compositions vary so much.) And last, out of 15 old briquettes which were seasoned according to the laboratory practice, only two have been outwardly affected, though treated from nine months to two years. These two are the weakest, as before pointed out. The briquettes which remained unaffected were cured from one to two years in water. Though only two of the 15 have been destroyed by oil, all have penetrated, and also possibly will fail in time.

TABLE III.—CLASSIFICATION OF FATS AND OILS (Only the More Common Primary Fats and Oils are Given.)

- Solid fats
  - Vegetable
    - Palm oil.
    - Cocoanut oil.
  - Animal
    - Goose fat.
    - Lard and lard oil.
    - Beef marrow.
    - Tallow and tallow oil.
    - Beef and mutton tallow.
- Oils or liquid fats
  - Vegetable oils
    - Drying
      - Linseed oil.
      - Hemp and poppy seed oil.
      - Tobacco oil.
    - Semi-drying
      - *a.* Cottonseed oil.
      - *b.* Mustard oil, Rape oil.
      - *c.* Castor oil.
    - Non-drying
      - Olive oil.
  - Animal oils
    - Marine
      - Fish—Sardine.
      - Liver—Cod and shark.
      - Blubber
        - Seal and whale.
        - Dolphin & porpoise.
    - Terrestrial
      - Sheep's foot.
      - Horses' foot.
- Mineral oil—crude petroleum
  - Naphtha
    - Gasoline.
    - Benzine.
  - Illuminating oils
    - Kerosene.
    - Petroleum.
    - Paraffine.
  - Lubricating oils.
  - Paraffine wax.
  - Vaseline.

With all this conflicting data, we are still in the dark as to the possible final effect of fats and oils on concrete structures. The following conclusions, however, are reasonably certain: First, most oils penetrate concrete mortar, which makes them dangerous. Second, concrete is more liable to be disintegrated when saturated with oils and fats if not thoroughly set. Third, a good quality of concrete is less susceptible to the effect of oil than a poor quality, such as a porous, frosted, lean, poorly mixed or improperly seasoned concrete. Fourth, ordinary concrete work is rarely subjected to continued large doses of oils. It is more often only occasionally spattered. Disintegration under the latter conditions seems remote, especially in the case of first-class, well-seasoned concrete. (The concrete floor above referred to is an excellent example. The oil spattered on it was oxidized, perhaps, or absorbed by the dust, and instead of penetrating, helped to protect it.) Last, even though subjected to the equivalent of continued saturation, the disintegration would be long drawn out if the concrete were properly made and well set.

These conclusions may eventually be altered, though it must necessarily be a long time before definite results will be obtained from the further tests now under way. In the meantime, more experiments will be started, especially on the poor quality of concretes, and also tensile tests on well seasoned briquettes.

Table 1 shows the effect of oils on the Portland cement briquettes which have just been discussed. A study of it will perhaps reveal more than has been said. It does not include the tensile tests or the untreated briquettes which were made for comparison.

A more complete classification of fats and oils is given in Table III. The subdivisions are made from a physical and chemical standpoint. In the latter respect, however, the classification is not as good as in the former because the chemical compositions of oils differ largely even for those of the same subdivision. Only the more common primary fats and oils are given. The varieties are many. It can thus be seen that a wide range of experiments is desirable to cover the entire field. This is all the more necessary because of the chemical differences before spoken of.

Even under ordinary conditions, it seems very desirable to use a wash for oil-spattered concrete that will prevent oils from penetrating. It is also possible that concrete seasoned according to ordinary practice will not resist oil as well as the water-cured briquettes. Most of all to be protected are oil-spattered reinforced structures, for their strength depends entirely upon the quality of the concrete and no chances can afford to be taken. It would therefore he well if some simple wash could be applied to protect it from oils. While experimenting with the effect of oils several attempts were made to discover something that would answer that purpose. Attention was first attracted to linseed oil. This, it will be remembered, did not penetrate, but formed a coating on the outside of the briquette which apparently protected it. However, after two months' application of lard oil the linseed oil was penetrated, and later the briquette was disintegrated. Other oils are slower in their action on linseed oil.

Another experiment was made with alternate washes of a 5 per cent. solution of alum and a 7 per cent. solution of castile soap, known as Sylvester's process of making concrete impervious to water. The combination of the two solutions forms an insoluble precipitate which fills the voids. Five washes of each were applied alternately. This coating failed to prevent the oil from attacking the mortar.

These same solutions were also tried in a different way. The briquettes were made with them instead of water. One solution was first thoroughly mixed with the cement, the other solution added and then moulded into a briquette. When treated with oil, these showed up inferior to the other method. Moreover the briquettes broke about 20 per cent., below the untreated, which weakening is contrary to what has been claimed for it. Briquettes made according to this process, when 14 days old were treated for six months with extract of lard oil and were badly disintegrated. Briquettes of the same series which were made in the regular way were cracked but did not crumble so badly.

The next experiments were made with paraffine, because there are few things that attack it, including all acids and alkalies. The obelisk in Central Park, New York, and many stone buildings have been treated with

Fig. 1—Setting-Derricks on Side of Truss. Spout for Depositing Concrete.

it to prevent weathering. Part of the briquettes were coated on the outside by dipping them in hot paraffine, and other briquettes were heated and held in hot paraffine until it penetrated 1/8 in. Neither of these experiments apparently prolonged the time before disintegration by oils. The results were a great disappointment.

Sodium silicate, or what is known as water glass, was the last tried. This is a fireproof oil or varnish, and is sometimes used to prevent stone from weathering. This coating was dissolved in 20 days. One of the briquettes has been disintegrated, although the oil has been applied for only about a month and a half.

Table II. covers the tests on the briquettes which were treated to preserve them from the effects of oil. A study of it will reveal more than has been pointed out in the paper. It contains full information about all of these tests.

The difficulty experienced in finding a cheap wash that will absolutely protect concrete from oil is apparent. Something is wanted that will penetrate into the concrete to allow for wear, and most of all, will be inexpensive. It is hoped that by thus bringing the matter to the attention of engineers and concrete users, further investigations along these same lines will be started, or at least that suggestions that can be tried in established laboratories will be brought out. Let us hope that the time is near when it will not be necessary to use brick facing and stone caps for massive concrete exposed to oil, or in the absence of these feel uneasy about the final character of the concrete. Moreover, we do not want to limit the use of reinforced concrete to those places where there is no oil.

Acknowledgement should be made of the work of the company's cement tester, Mr. Geo. J. Griesenauer, in furthering these investigations.

Sheet Pile and Canvas Cofferdam for a Large Concrete Pier.

BY J. C. HAIN.
Engineer of Masonry Construction, C., M. & St. P.

In the early part of September, 1902, work was started on the foundation of a large pier in the Wisconsin river, near Kilbourn, Wis.,

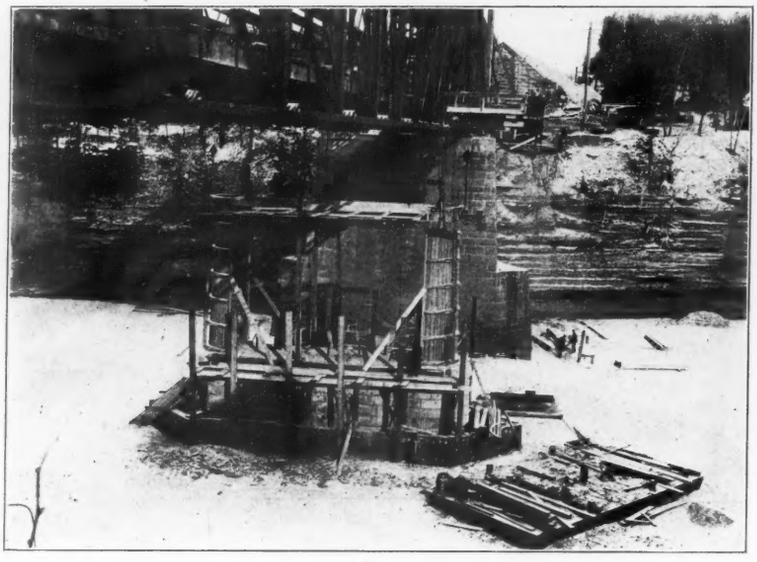
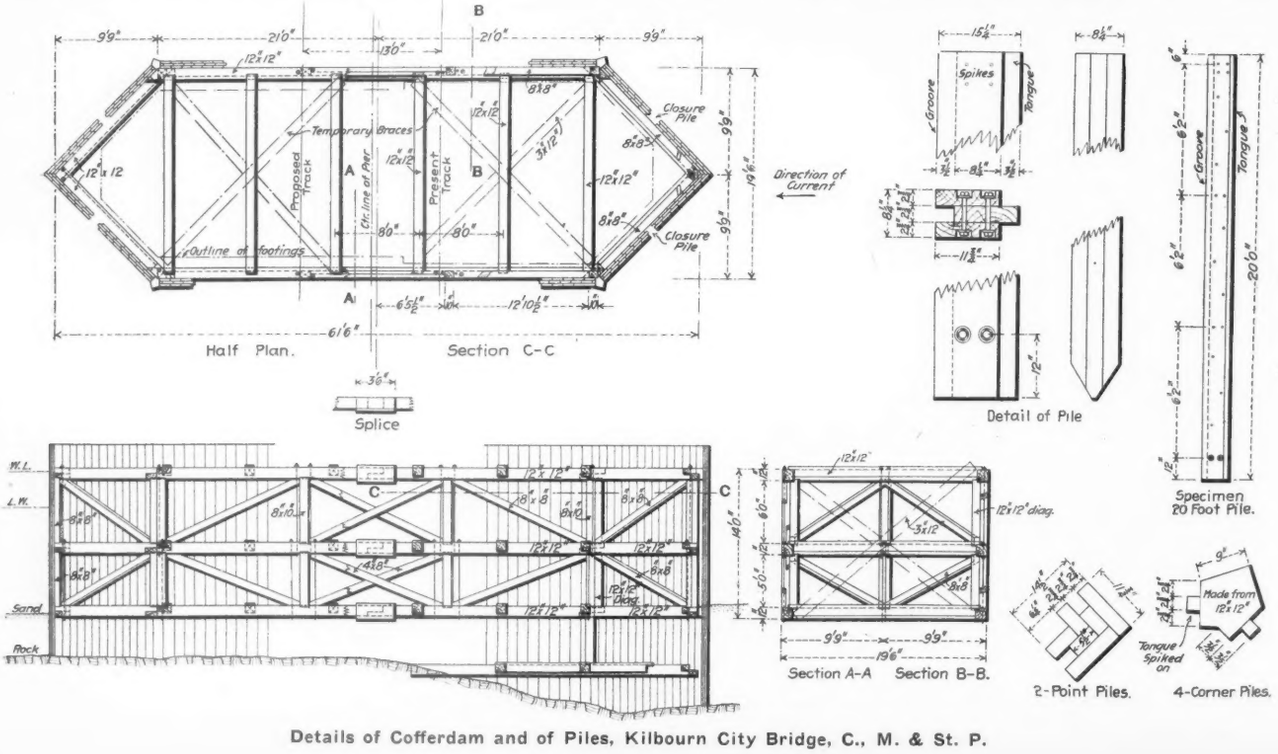


Fig. 2—Concrete Mixing Plant on Shore: Forms for Round Noses of Pier in Place.



Details of Cofferdam and of Piles, Kilbourn City Bridge, C., M. & St. P.

where the Chicago, Milwaukee & St. Paul crosses that river at the famous "Dells of the Wisconsin." Some of the methods used, while perhaps not original, may interest the reader. The conditions were somewhat unusual, though not extraordinary. The bottom of the river was ledge rock, dipping to the east and north (the latter up stream) quite considerably. Overlying this was several feet of loose shifting sand, containing some loose rock. The channel was narrow and confined between vertical rock bluffs for a long distance above. The current was very swift, averaging from six to eight miles an hour, and the changes in water level were liable to be very sudden. The rock bottom averaged from 18 to 23 ft. below ordinary water level and from 29 to 34 ft. below high water. These were the conditions where a pier about 60 ft. high (including footings), for a double-track bridge was to be built. The inside dimensions of the cofferdam required were 19 ft. 6 in. by 61 ft. 6 in. The length, however, included two pointed noses, as will be seen from the drawings.

It did not seem necessary to build a dam for the highest stage of water. The work was started late in the fall, as already mentioned, and was finished before the spring high water; therefore only occasional high water of short duration had to be contended with. It was considered best to build the top of the cofferdam about 3 ft. above the ordinary stage of water, and abandon the work if the water went over the top. The dam was only once completely submerged.

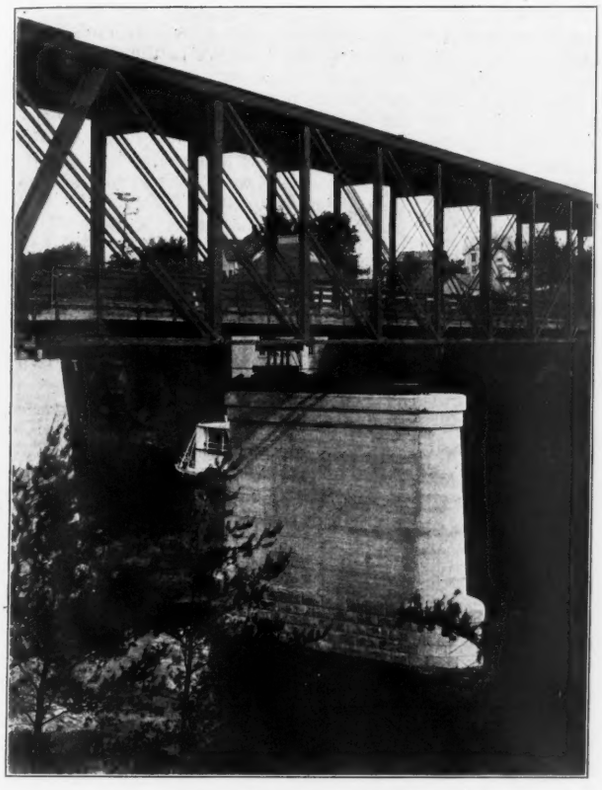
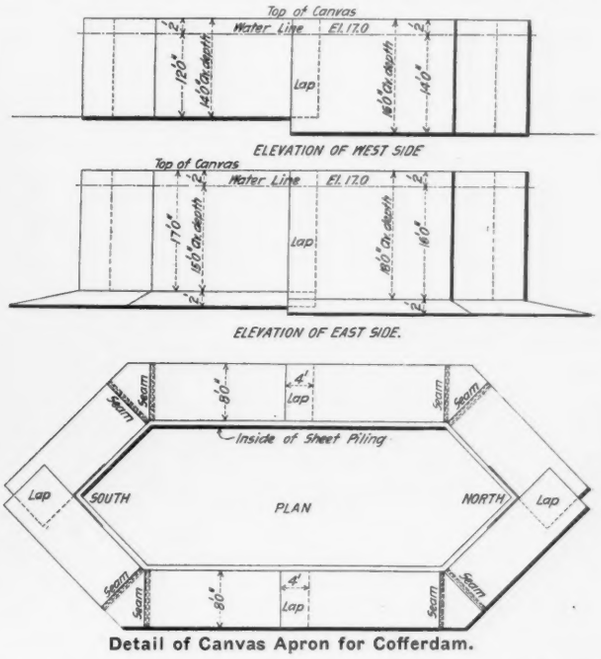
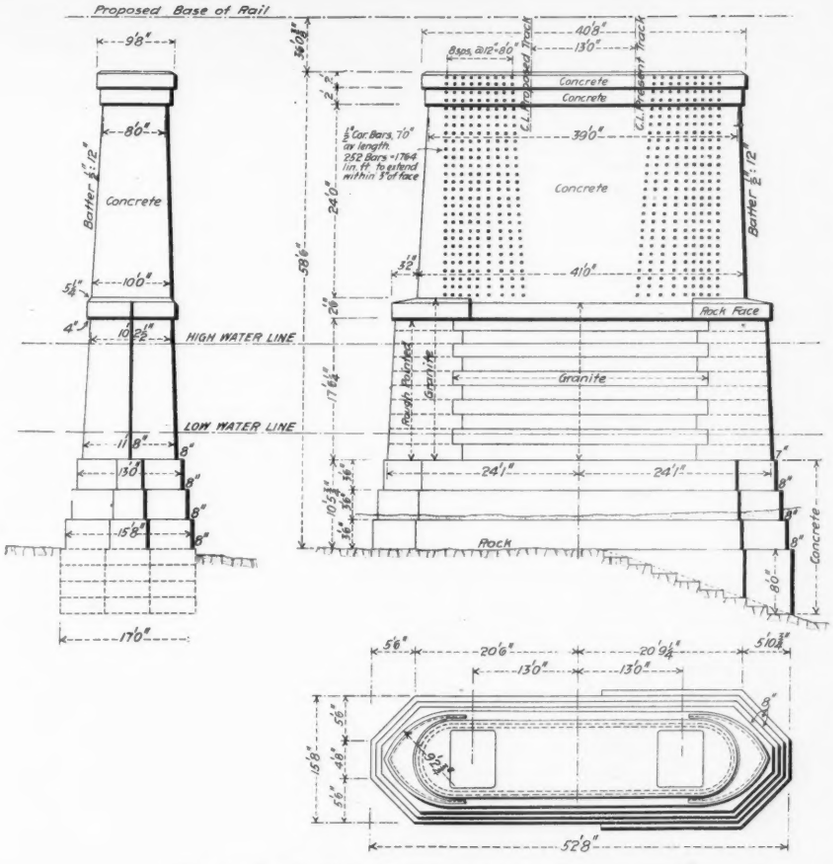


Fig. 3—Finished Pier.



Detail of Canvas Apron for Cofferdam.



Plan and Elevations of Center Pier for Kilbourn Bridge.

A double and single cofferdams were thoroughly considered, but conditions seemed less favorable for the double. The material in the river was very loose sand. There was nothing to hold the outside sheet piling in place. The pier was so large that outside frames were out of the question without tying to the inside. The bolts could not be put in without the assistance of divers, and, moreover, were undesirable because of possible leaks. Furthermore, filling for the space between the sheet piling could not be obtained at the location, but had to be handled by train and rehandled before placing. The single cofferdam largely eliminated these features, and was therefore adopted.

A single row of three-ply sheet piling was used, made of 3 in. x 12 in. material, lapped so that a 3½-in. tongue and groove was made. Two-thirds of the planks were surfaced to a uniform thickness. The outside plank was undressed. The piling was spiked and bolted together as shown in the drawing. Countersunk bolts were used only in the bottom, to be sure that the battering on the rock would not crowd them apart. Though the top of the piling had the same, if not a greater, tendency to separate, it seemed necessary to use bolts only as the occasion required.

The general design of the cofferdam frame is shown in the drawings. It was weighted down with scrap rails and secured in place by two wire guys which were anchored to

the rock on either side of the river. Wire guys were used instead of rope to eliminate variations in length. One of the guys crossed the navigable channel, which necessitated weighting and sinking it so as not to obstruct pleasure craft, which was the only navigation in the river. The hold of these guys on the frame was changed as required to prevent interference with the driving of the sheet piling. No little care was needed in making these changes to prevent a movement of the dam. The difficulty was increased by the strong current. When the driving was finished, the guys extended around the lower end of the cofferdam.

A light land pile-driver was used to place the sheet piling. No hammering was required to penetrate the loose sand; in fact, the sand disappeared from the location of the pier before the driving was finished, undoubtedly caused by the increased velocity produced by the obstructions. Great care was taken in driving, especially to have each pile fit snugly to the adjacent one, and after it reached the rock more light pounding was done in order to broom the ends of the piling, and thus make it fit more closely to the irregular rock surface. The latter pounding was not started, however, until the piles were all driven, for fear of displacing them. The piles were not beveled to make them draw, because what sand was left, if any, was so loose that it gave little resistance to the driving, and hence did not help direct the pile. However, they were beveled to conform to the slope of the bottom as nearly as practicable. The pile was also sharpened on both edges so the blunt end was about 1½ in. across as shown, so the driving would make them conform better to the rock surface. Both of these precautions greatly reduced the leakage at the bottom. The most serious trouble was with loose stones on the river bed, which sometimes necessitated taking out the pile, displacing the stones and redriving. The principal leakage was caused by these loose stones. The six corners had specially designed angles as shown. These were made watertight, then driven and securely fastened to the framework. Driving was then done in both directions from the corners, and a closure put in about half-way between, there being six in all. The greatest care was used in designing, making and driving the closures, the success of the entire cofferdam depending on them. They were made to wedge in slightly.

The feature in this dam which was perhaps of most interest was the canvas which was used around the outside, the drawings of which are shown. As will be seen, it was made up in four pieces, so arranged that the lower apron lay flat on the river bottom for 8 ft. out from the dam, and the upper part extended above water level to prevent the water getting behind it. Some little difficulty was experienced in placing it because of the swift current, but with the outer edges weighted with sand bags and scrap rails, and by using rails suspended horizontally from ropes and moving them up and down the side of the dam, the canvas was placed. It was found desirable, however, to first sew the four pieces together. About 50 cars of gravel were then placed on it. This completed the dam.

One 6-in. and one 8-in. vertical centrifugal pump were used to empty the pit. The leak was almost entirely around the bottom where the sheet piling encountered loose rock. Two seams in the rock also admitted water. The sides of the dam were dry enough to strike a match on. When the dam was finished the leaks in the bottom were small. The 8-in. pump was then more than ample to keep the water down. This was an excellent record for so large a dam in such swift running water. The leakage perhaps would have been still less if the sand and rock had been removed from under the lower apron of the canvas. The company is convinced that in economy of material and labor and in ease of construction this design greatly surpassed any other.

A few words in regard to the construction of the pier may be of interest. It was built entirely of concrete except 20 ft. of the neat work from a little below low water, which was faced with granite. The face stones were handled by derricks attached to both sides of the iron trusses. These derricks can be seen in two of the photographs. Another derrick on the dump handled the stone at the level of the track (top of the truss) and loaded it on push cars which were shoved down to the setting derricks on the lower deck of the bridge, which is a highway. At that point the car was run on a turntable and placed at either derrick as needed. The concrete was mixed by machine at the level of the highway at one end of the bridge and dumped through the floor in the spout which can be seen in one of the pictures. The mixing plant is also shown. The spout worked very satisfactorily, although the concrete was dumped a maximum of 70 ft. The delivery was easily directed to the location desired and deposited in perfect condition. The spout was cut off as the work progressed. The concrete work was done in winter (which accounts for the use of the reinforcing rods shown in the plans). However, by taking proper precautions an excellent job was obtained. The appearance of the pier is suited to the location, the starting point of a trip along the picturesque "Dells of the Wisconsin."

The bridge and building department of the Chicago, Milwaukee & St. Paul, of which Mr. C. F. Loweth is Engineer and Superintendent, builds all of its masonry structures with its own outfits and forces. This job was handled in that way.

A Simple Easement Curve.

BY PAUL STERLING.
Asst. Engineer, N. Y., N. H. & H.

A simple and easy method of quickly locating an easement curve in the field has puzzled more than one young engineer. Although the method about to be described is not original, the writer, in using it constantly in the field for nearly ten years, has somewhat simplified it and made it an easy and practicable solution. The principle on which it is based is to shift the tangents to the original curve; calculate a new curve to pass through the same central point as the original curve; and join the original tangents with the new or shifted curve by parabolic curves. Its advantages are that the entire original curve is not shifted to any great extent, since the new curve passes through the original center; the calculations necessary can be quickly made for any curve of an odd number of minutes; mathematical tables are not required; and last but most important of all, the curve stakes can be located in the field quickly and easily by deflection angles with the transit, there being a number of good check angles.

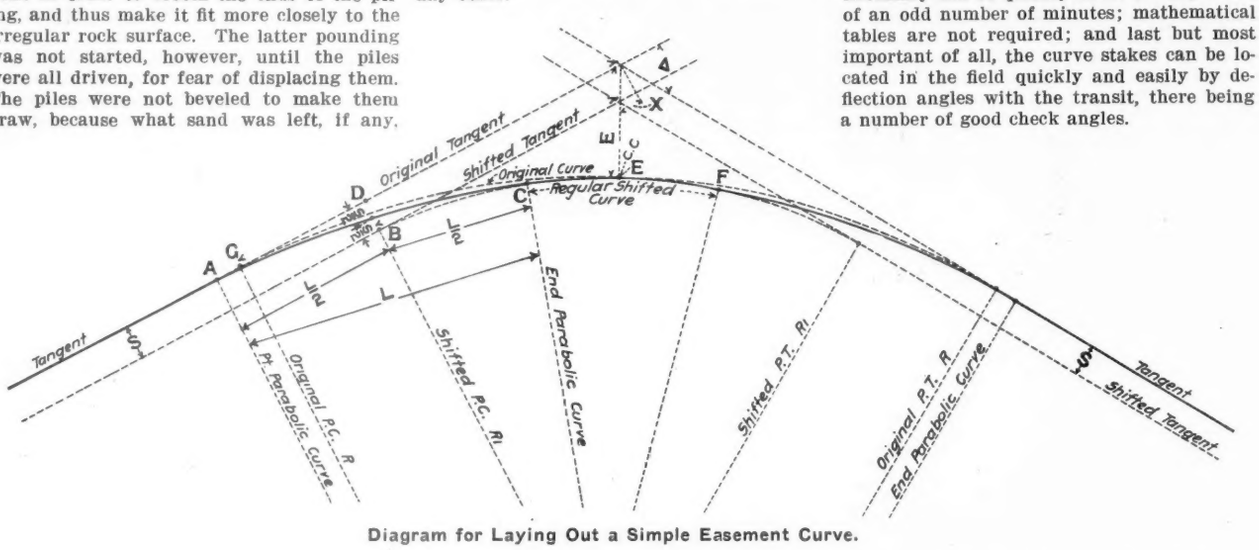


Diagram for Laying Out a Simple Easement Curve.

Referring to the accompanying diagram:

R = Radius of original curve.
E = External secant of original curve.
R_1 = Radius of shifted curve.
L = Length of easement.
S = Shift of tangents.

The shift of the tangents must be assumed by the engineer, depending upon the degree of curvature and the extent to which the point of curvature and the point of tangency can be changed without interfering with the location of cuts, fills, bridges, etc. Mathematically,

$$R_1 = \frac{R\,(E - S)}{E} - S$$

and

$$L = \sqrt{24\,R_1\,S}$$

Also, the angle taken off the shifted curve by the parabolic curve is equal to $\frac{L}{200} \times$ deg. of shifted curve. The total angle of the parabola is equal to one-third of the angle taken off of the curve by the parabola.

Divide L into any number of chords. Then the first deflection is equal to

$$\frac{\text{Total angle of parabola.}}{(\text{Number of chords})^2}.$$

2d deflection = 4 x 1st deflection.
3d " = 9 x 1st "
4th " = 16 x 1st "
5th " = 25 x 1st "

Set the transit at B on the shifted tangent and lay off C on the shifted curve at a distance equal to $\frac{L}{2}$, continuing the curve through E. Then set the transit at A, de-

flecting for the parabola the angles already calculated for the difference between the parabola and the shifted curve. As a check, the parabola should pass through a point half-way between B and D and coincide with C, of course. The other end of the curve may be laid off in the same way.

For example, let

Δ, intersection angle of tangents = 30 deg.
Degree of curve required = 4 deg.
Radius of curve required = 1,433 ft.
Length of intersecting tangents = 384 ft.
External secant E = 50.5 ft.

Assume S = 2 ft., then

$$R_1 = \frac{1433\ (50.5 - 2)}{50.5} - 2$$

$$= 1{,}384 \text{ or a } 4 \text{ deg. } 12 \text{ min. curve.}$$

$$\text{Also } L = \sqrt{24 \times 1{,}384 \times 2} = 258 \text{ ft.}$$

$$\text{and } \frac{L}{2} = 129 \text{ ft.}$$

The angle taken off of the shifted curve by the parabolic curve $= \frac{258}{200} \times 4.2$ deg. $= 5$ deg. 24 min.

The total angle of the parabola $= \frac{1}{3} \times 5$ deg. 24 min. $= 1$ deg. 48 min.

Assume six chords of 43 ft. each. Then the first deflection

$$= \frac{1 \text{ deg. } 48 \text{ min.}}{36} = 0 \text{ deg. } 3 \text{ min.}$$

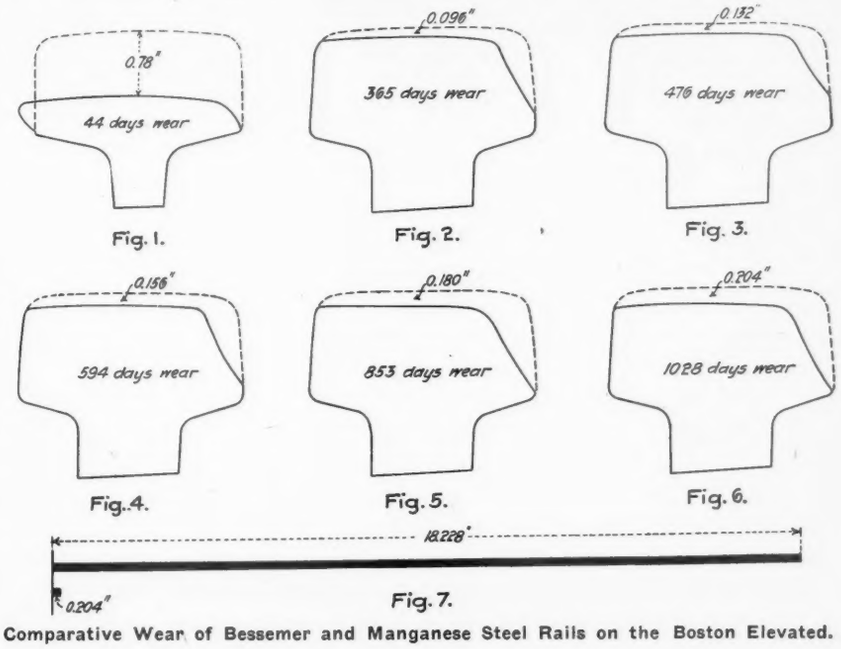
2d	deflection	=	4 x 1st	deflection	=	0 deg.	12 min.
3d	"	=	9 x 1st	"	=	0 "	27 "
4th	"	=	16 x 1st	"	=	0 "	48 "
5th	"	=	25 x 1st	"	=	1 "	15 "
6th	"	=	36 x 1st	"	=	1 "	48 "

The tangent of a curve of 1,433 ft. radius where $\Delta = 30$ deg. is 384 ft., and the tangent of a curve of 1,384 ft. radius with the same intersection angle is 365 ft. In this case, therefore, the point B is 19 ft. ahead of G. The distance X for all practical purposes need not be taken into account. Put in B, therefore, 19 ft. ahead of G and offset 2 ft. Back sight on the shifted tangent and turn for 129 ft. or $\frac{L}{2}$ on the shifted curve (2 deg. 42 min.). Put in C and then run the rest of the shifted curve through the original center E. Set the transit at A and backsight on the original tangent. Deflect for the six chords of the parabola as calculated and set the points on the parabolic curve. As a check the third or central deflection should pass through a point half-way between B and D and the sixth or last deflection should pass through C.

Manganese Steel Rails on the Boston Elevated.

Shortly after the Boston Elevated was opened to service, an alarming rate of rail wear was noticed at many places on the line. Heavy wear was anticipated on account of the numerous sharp curves and steep grades but the actual length of service of the rails laid was much shorter than any previous experience on other steam or electric roads would have seemed to indicate. The original rails were commercial Bessemer steel, low in carbon or other hardening ingredients and at some of the sharper curves they were completely worn out in from 40 to 50 days. There were a number of reasons for this rapid rate of wear; the curves were sharper than on any other road in the country; the grades were heavy and frequent and every car in the train is a motor car which intensifies the grinding effect on the top of the rail head because each pair of wheels become driving wheels, and if the train is stalled they will grind holes in the rails.

It was noticed at a number of the places where the worst wear took place that some of the rails did not wear as fast as others, and this led to a careful analysis of the metal in the slow and rapid wearing rails. It was found that the slow wearing rails, though intended to be of the same composition as the soft rails, were higher in carbon and therefore had more surface hardness. A number of rails were rolled which were high in carbon, and these were laid in the track with uniformly good results, although on account of the extremely severe conditions of service, they still wore out with great rapidity. They lasted about three times as long as the ordinary commercial rails and cost but little more. Some nickel steel rails were also tried, and while they were an improvement over the commercial soft rails they did not prove in the end to have as long a life as the hard carbon steel rails. A nickel steel rail was laid on the outside of the 100-ft. radius curve at Causeway and Haverhill streets between two hard steel rails and measurements were taken at intervals of four weeks until the rails were taken up at the end of 204 days on account of the marked difference of wear between the nickel rail and the hard steel rails on either side of it. The nickel rail wore down on the head .528 in. in that time as against .18 in. for the hard steel rails, and the side wear was about in the same proportion.



Comparative Wear of Bessemer and Manganese Steel Rails on the Boston Elevated.

Some time before this experiment was being made the southbound track at the entrance to the Park street station in the Boston Subway was laid with manganese steel rails supplied by William Wharton, Jr., & Co., of Philadelphia. This is on a reverse curve with a radius of 82 ft., or about 75 deg., and the daily traffic passing this point is 44,000 tons a day. The commercial Bessemer rails first laid here wore out in 44 days or less, the amount worn off of the top in that time being .78 in. Fig. 1 shows a section of the soft rail after being removed at the end of 44 days. The peculiar direction in which the head wore is at once noticeable. On the inside edge there is evidence of some side wear, but the top has worn down uniformly and is crowned almost the same amount as the original section. Only a slight burr is formed on the outside edge, showing that the top of the rail has been ground away and not squeezed out of shape. Figs. 2 to 6 show sections of the manganese rails laid at the same point on April 26, 1902. At the end of the first year the top wear was .096 in. and at the end of 1,028 days on Feb. 17, 1905, the top wear was only .204 in., and was uniform across the top of the rail head. It will be noticed that the side wear in the case of the manganese rail is rapid and uniformly progressive. Fig. 7 shows the comparative wear of ordinary steel and manganese steel rails for 1,028 days on the basis of the observed wear of each. It is too convincing to need comment.

At the present time the Boston Elevated has in its track about 475 ft. of manganese steel rail, several ordinary frogs and three sets of crossing frogs made from the same material. The average life of the frogs and switches on curves is about four to six months, but on tangents the life is as long as that of the rails. When the manganese rails were first laid on the Park street curve they were allowed to take all of the side wear but they are now protected by a guard rail along the inside rail, which is greased several times a day, and which is allowed to take up the flange pressure. The grease prevents an undue wear on the guard rail. In the matter of cost the manganese rail is very expensive as compared to commercial Bessemer rail, but its long life makes it economical to use in such places as the elevated curves where rail renewals are expensive to make. The manganese rail costs about $5 per foot as against 38 cents for Bessemer rail.

Manganese steel was first discovered about 20 years ago by Mr. R. A. Hadfield, the famous steel maker and metallurgist of Sheffield, England. In experimenting with various alloys of steel he found that an alloy of manganese and steel containing not less than 6 per cent. and not more than 20 per cent. of manganese possessed the remarkable property, that while already very hard when cast, if it is heated to a high temperature and suddenly cooled by plunging into water it becomes tougher and more ductile without losing any of its hardness, a phenomenon which is the exact opposite of that which is observed with any of the other hard carbon steels or steel alloys. The combination of hardness and toughness produces its great wearing qualities. Mr. Hadfield's first patents covered the alloy with the percentage of manganese stated and the rights for making the alloy in the United States were secured by the Taylor Iron & Steel Co., High

Bridge, N. J. Wm. Wharton, Jr., & Co., of Philadelphia, first made use of manganese steel in frog and switch work in this country. They have used it in special track construction for a number of years with excellent results, one frog made for the Pennsylvania having outlasted 17 frogs made of carbon steel. It has been used for guard rails on steam railroads and a test is being made with split switches having manganese steel points.

Manganese steel is cast into the required shapes as it cannot be rolled or machined. It is a metal exceedingly difficult to handle in the foundry, as it must be poured at a very high heat and its shrinkage is enormous compared with ordinary cast-steel. It is almost impossible to make intricate castings on this account, and the metal is so tough and hard that it cannot be machined. All finishing must be done with grinding machines. The rails furnished to the Boston Elevated were cast in 20-ft. lengths with the bolt holes for the joints cored in the web. A drill which will drill a hole in a Bessemer rail ⅜ in. deep in one minute makes no impression on a manganese rail. The rails are very ductile, however, as is shown by the following test of one of the 20-ft. lengths. It was first bent cold to a 20-ft. radius; half of the length was then straightened and bent to the reverse curve of 20-ft. radius. The other end was then bent to a 10-ft. radius and no signs of fracture were observed at any point.

We are indebted to Mr. H. M. Steward, Roadmaster of the Elevated Division of the Boston Elevated Railway, and to Mr. Victor Angerer, Vice-President and General Manager of Wm. Wharton, Jr., & Co., for the diagrams and information.

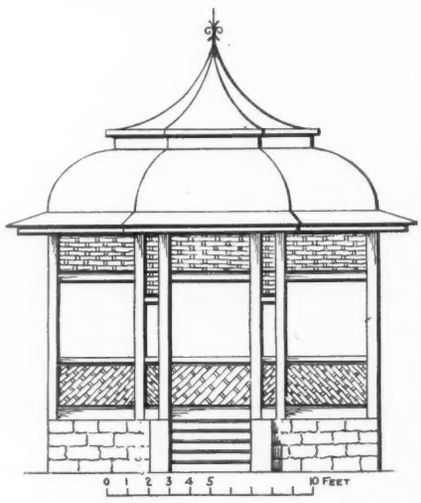
Railroad Gardening.

BY A. REINISCH,
Consulting Landscape Gardener, Atchison, Topeka & Santa Fe.

There was a time when parks and pleasure grounds were a luxury that only a few could enjoy. Wealthy land holders with refined tastes and sensitive to the beautiful in nature surrounded their homes with beautifully laid out grounds. A stately building towered out of the foliage of magnificent trees and bushes, between which were provided open spaces for formal gardens with a profusion of rare flowering and foliage plants. From the verandah, or pergola, the eye could roam over a clean stretch of richest green turf, bordered by a bank of shrubby growth and trees with a variety of forms in body and skyline. Some who possessed still more wealth could add fountains, lakes, bridges, pavilions, etc., to their still larger grounds. But all these grounds were exclusive, to be enjoyed only by their occupants and invited guests; the "people" could admire them from a distance only.

By a process of evolution the park has come down to the cities and towns. The park idea has become so general that everybody has an appreciation of and a desire for beautiful natural surroundings. The civic improvement societies can be found in nearly every city and town, and in a great many farming communities. We have developed a higher standard of civic pride, and with it a higher standard of home adornment and home surroundings. In fact, we have become so accustomed to improved grounds, public and private, that we look for them, and when we come upon a beautiful building with unimproved, or neglected, or ill-fitting surroundings we are unfavorably impressed by the discord. We look for improved station grounds on our railroads. If the depot is a fine and imposing structure we look for a setting to correspond with it in extent and quality.

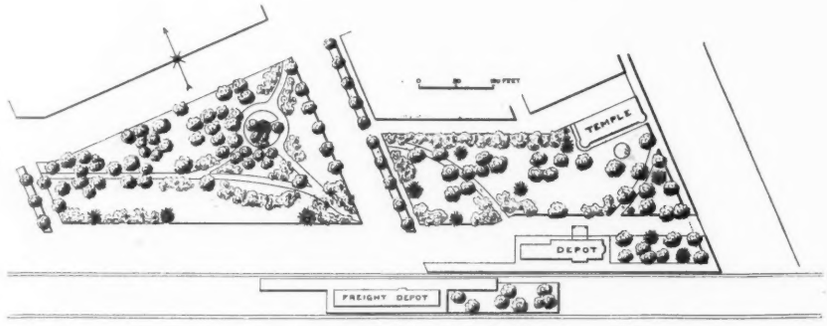
The extent to which railroad gardening is practiced is yet deplorably limited, for the natural reason that it is neither a direct necessity nor a source of direct revenue. The effect of these improvements is yet greatly underestimated. Not only are the immediate surroundings of the station building elevated to a higher standard of beauty and value, but the example has a beneficial effect on the town or city in which the station is located and the bettered environment of it spreads with ever enlarging wave-cir



Pagoda in Station Park.

cles, permeating the whole community, enhancing the value of property and making the town a more desirable place to live in. This, of course, apart from the advertising value to the road. The treatment of the grounds can be made in a simple style and the operations will sum up about as follows:

1. Grading the ground surface, which includes the clearing of stones, bricks, ashes and other foreign substances detrimental to plant growth.
2. Approaches conveniently located.
3. Enriching the soil.
4. Establishing a uniform covering of sod.



Station Park at Sterling, Kansas.

5. Planting trees and shrubs arranged in such a manner as to leave open spaces of turf between the groups or banks of woody material. Where the grounds are extensive and at points where passengers have to wait for trains, it will be necessary to build a small shelter or pavilion, which at the same time adds to the beauty and interest of the planting. Other features, as fountains, arbors, etc., are often desirable. Extensive grounds should have walks for promenading in which are provided shady recesses with seats. This treatment is rich and economic at the same time; being all done with hardy material it is permanent, and grouped in a systematic way it is easily and cheaply maintained. The tender material, like bedding plants from glass houses, would probably find more admirers, but the effect is rather weak, considering the perennial first cost and short life, say, five months, at the most.

It is conceded that these improvements should be carried out in a systematic and most thorough manner; that they should extend over all stations, large and small; that they should be made through an official trained and competent in that particular work, and not in a haphazard way by any chance employee who can squeeze an hour or so now and then from his other duties, for everybody's business is nobody's business. That these improvements, even after their necessity is recognized, are put off and deferred till some future time may be explained by the fact that numerous other duties occupy the time and attention of the railroad management. Conditions suddenly spring up that demand the full time and energy of the officers. Additions, changes and repairs are called for that require an outlay of great sums of money, and are imperative in order to keep up or to increase the earning capacity of the road.

The landscape department, once started and organized, will work without any difficulty and cost much less than first anticipated. In can even be made self-supporting, if not directly profitable, by combining with it timber production for railroad uses. The landscape gardener who can design, plant and maintain railroad parks is equally competent to manage timber plantations of half a dozen species of trees. To be successful in either branch, he must be loyal to his commission and energetic, and possess executive ability. The railroad has a great advantage over the individual and over other corporations in the possibility of centralizing the production of the planting material, as distance counts very little and the final cost of transportation is reduced to a minimum when the railroad is its own carrier.

The Santa Fe has in recent years made some very successful experiments in co-operation with towns in the beautifying of station surroundings. The interest is common to both; the depot of the road is the gateway of the town through which it receives its visitors and new commerce. We have three stations where co-operation has been tried and found eminently successful and satisfactory to all parties concerned. They are Sterling, Nortonville and Osage City. Sterling is a small thriving city between Hutchinson and Dodge City on the main line. The road has no holdings beyond the right of way, and of this there was only a nar-

row strip available for embellishment. The city had some triangular pieces of vacant land near the station. The Free Masons also owned some lots between their temple and the right of way, and, like the city, they were willing to join the railroad in park building. Neither one of the different parcels of land was large and compact enough to admit of as satisfactory a treatment as the properties combined. As can be seen by the accompanying plans, the three pieces were laid out in one park and the result is gratifying and a source of pride to the citizens and the railroad management alike. The traveler unconsciously gets the suggestion that he will find here good streets, good schools and churches, lodges that bid him a friendly welcome, excellent farms, a progressive and most desirable community to live in, and live newspapers with public spirited editors—all this as the result of a little landscape gardening! And he will be quite justified in his belief that a community with a well-developed civic pride will be a good community to live in.

In Osage City, also located on the main line between Topeka and Emporia, the conditions were similar and the result gratifying as at Sterling, only the grounds are smaller. It proves that, what would be impossible or at least very difficult for either one alone, is quite easy for the city and railroad combined. In this instance, especially, the holdings of either party alone were too small to permit of any satisfactory plan, while the two combined could be treated with quite good result.

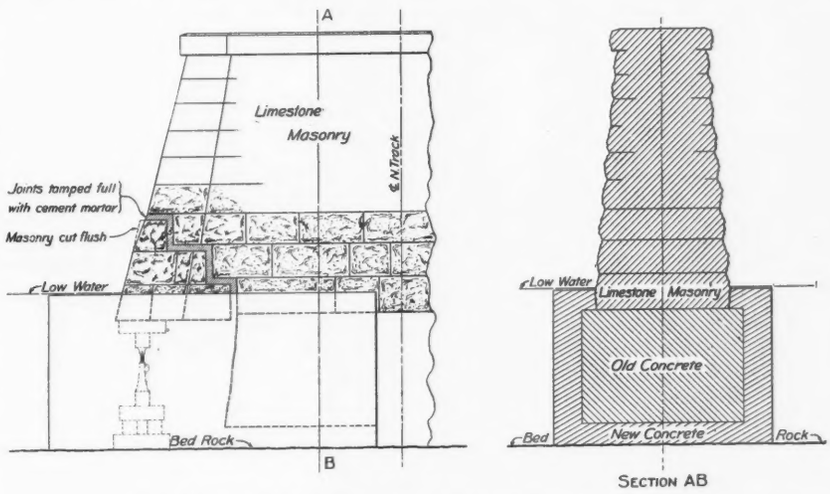
Nortonville is a station between Topeka and Atchison, on the original Atchison & Topeka Railroad, from which developed the Santa Fe System. On both sides of and adjoining the right of way and station the city owns strips and squares of land, which have been improved and are maintained like those in Sterling and Osage City as station parks.

A good deal has lately been said and written about the improvement of the right of way between stations. Many schemes and propositions, good and bad, have been launched. Looked at from the standpoint of the operating department, the purpose of the right of way is to provide a roadbed over which to move the traffic. The material, as earth, gravel and stone outside of the roadbed is needed frequently for repairing the track, so that it could not well be used for permanent planting. For timber production, only the tangents and outside of curves could be used, but for this purpose the strips are too narrow to produce straight trees, the outside surface of the plantation being out of all proportion to the little core which receives the benefit of crowding and consequent shading off of the branches. The nearest practical schemes—at least on the roads of the west and middle west—would be to let such parts of the right of way as are not needed to adjoining properties for agricultural purposes, and even this may have serious drawbacks. From an esthetic standpoint, the improvement of the right of way has little value. The traveler moves over the ground with such speed that observation is limited, except as to the distant panorama, over which the road has no control, and the few who can enjoy the landscape from the rear platform of trains constitute an insignificantly small part of the whole traffic. For the present, at least, the problem of any further beautifying of the right of way between stations than that comprised in tidying up the line, must remain dormant. The station grounds must come first, and they should receive the attention and treatment fitting the character of the station, and the importance and dignity of the railroad of which it is a part.

Repairing a Bridge Pier Foundation on the Burlington.

The bridge department of the Burlington has been engaged the past winter in doing an interesting bit of repair work to one of its bridge pier foundations. The bridge is on the main line across the Des Moines river, about four miles west of Ottumwa, Iowa. Originally built as a single-track bridge, it was converted into a double-track structure by lengthening the piers and putting in double-track spans in 1899 and 1900.

The natural foundation is laminated limestone, the crevices of which are filled with earth and sand. The stone is overlaid with about 4 ft. of sand and silt. At each pier large quantities of riprap had been put in. This increased the difficulty of extending one of the piers considerably, as it was almost impossible to keep the cofferdam tight and the contractors failed to attain the best results in placing the concrete for the foundation. About two years after completion the lower course showed a settlement about 6 ft. back from the up-stream end, or new part. In the winter of 1903-04 an attempt was made to repair it, but failed on account of a sudden rise in the river breaking up the heavy ice and carrying away the entire cofferdam.



Repairing a Bridge Pier Foundation on the Burlington.

No further attempt was made until the following winter (1904-05) as the river is subject to sudden floods in the summer season. The restricted space for working under the bridge limited the height of the cofferdam so that its top was about 2 ft. above low water. A rise of that amount would therefore have been disastrous. In the second attempt a cofferdam of Friestedt interlocking channel bars was driven entirely around the pier about 3 ft. out from it except at the up-stream end, where a space of 8 ft. was provided for the pumps. Some of the riprap and loose stone from the old single-track pier, part of which was torn down at the time the extension was made, was raked out of the way and some was hoisted to the surface, a diver being used to attach the grappling hooks. A good deal, however, was covered with sand and gravel and could not be removed, causing some difficulty in driving the sheet piling through it. All piles, however, reached to within 6 in. of bed-rock. The water was about 10 ft. deep.

During the winter the water of the Des Moines river is very clear, carrying practically no sediment, and it was found that it leaked through the joints of the cofferdam so rapidly that it was impossible to keep it pumped out of the pit. A dam of sand, earth and manure was therefore placed entirely around the outside of the cofferdam, after which no difficulty was experienced in keeping the pit dry.

The old concrete was found to have broken away at the bottom, leaving a space of from 6 in. to 1 ft. between it and bed-rock, the space being filled with mud. It had settled down at the outer end, carrying down a section of the masonry, as shown in the accompanying sketch. The broken part of the concrete was removed, the broken section of masonry being held up by screw jacks. A number of old cast-iron jacks were used for the purpose and were left imbedded in the concrete. As soon as a section of about 4 ft. had been removed the space was filled with new concrete. The mud and sand below the concrete footing and back of the point of the pier was then removed, a short section at a time, and the space tamped full of concrete, working first on one side of the pier and then on the other. The concrete at the nose was brought up about half-way to the top of the lowest footing course of masonry.

The work was in charge of Mr. C. H. Cartlidge, Bridge Engineer, to whom we are indebted for the information.

Standard-Code Rules.*

Should not there be a Revision of those for Single Track?

BY H. W. FORMAN.
Author of "Rights of Trains on Single Track."

(*Continued from page* 203.)

There is no standard code rule governing the speed of trains through yards, but judging from the additional rules which are printed in nearly every book one picks up, it would seem advisable to incorporate such a rule in the code. As long as we cannot have main tracks built around yards so that yard engines can do their work without obstructing a main track, it is necessary to in some way prescribe how trains shall move through yards and also indicate under what restrictions yard engines may run or switch on the main tracks within yard limits.

The Union Pacific rule reads:

"Within defined yard limits, trains must

**Correction.*—In the article published in the *Railroad Gazette* of March 3, the last paragraph in the first column of page 183 should read:

"Rule A, of general rules, should read:—'Employees whose duties are prescribed by these rules must be furnished a copy, which they shall keep at hand while on duty.' The code rule is inconsistent as it requires a newly employed person to provide himself with something that he may not know is in existence. The above revised rule does not mean that employees shall carry, etc."

proceed under control." The Burlington prefers this:

"Yard limits will be designated in the time-table or indicated by marked posts or signs. Engines may work within yard limits without train orders; they must clear the time of first-class trains ten minutes, unless fully protected by fixed or hand signals, but may work against all other trains.

"All trains will reduce speed in passing through yard limits and proceed only as the way is seen or known to be clear."

The Queen & Crescent disposes of the matter thus:

"All trains, except first-class trains, shall approach yard limits with trains under full control and run carefully through the yard. The responsibility for an accident at such points will rest with approaching trains.

"Yard engines have the right to work within yard limits regardless of second and third-class trains, but will give way as soon as possible on their approach."

I have never been able to distinguish between "under full control" and "under control"; nor between a "full stop" and just a "stop."

The Rock Island System has a rule reading:

"Yard limits will be indicated by yard limit boards. Within these limits yard engines may occupy main tracks, protecting themselves against overdue trains. Extra trains must protect themselves within yard limits."

It is only natural that I should prefer the following Colorado & Southern rule, being the compiler of it:

"Certain yards will be indicated by yard limit signs. Within such defined limits, all trains, except first class, must reduce speed sufficiently to enable them to stop within the distance seen or known to be clear; and first-class trains must also proceed at reduced speed. No train may stop on the main track without protecting itself.

"Unless fully protected, yard engines must not occupy the main track within ten minutes of the time of a first-class train; they are not required to protect against other trains, but must keep a proper lookout."

It is desirable to have all trains run carefully through yards, as trainmen on the ground are apt to be run over, although all trains may be in to clear. It is a very poor place to make time, even with a fast mail train.

At this place in a great many books a special rule is inserted prescribing how trains shall follow each other into meeting and passing points. I neglected to state in its proper place that special rules governing yards may generally be found following Rule 91.

The Union Pacific has a rule 91A reading:

"At meeting and passing points the responsibility for a collision rests with the following train; but it must be distinctly understood that this does not relieve the forward train from protecting itself."

I recommend the following:

"91. (A). When trains run in company, time-table and train order meeting and passing points must be approached carefully and a proper lookout kept for the train ahead, but this in no way relieves the preceding train from protecting its rear, as prescribed by Rule 99."

My reason for referring to trains "in company" is that in case a train leaves a terminal several hours behind another it cannot be expected to always know what meeting points the train in advance will make or where it may be overtaken.

A lengthy discussion of Rule 99 is not possible in a dissertation of this kind, and very little good would be accomplished in any event, as opinion concerning it is about equally divided; fully one-half of the companies using code rules are satisfied with the present one, while only a few of the additions or changes which have been made in it meet with universal commendation. Yet uniformity seems as desirable and necessary in protecting trains as in other railroad practices. My idea of a good job of flagging would be to go back one-fourth of a mile from the rear of the train and place one torpedo on the rail, then move on back as far as is necessary to secure absolute protection, placing two torpedoes on the rail, two rail lengths apart, every fourth of a mile thereafter. This enables the engineman of the approaching train to move intelligently and also avoids delaying the train unnecessarily. The expense need not be considered. It must, of course, be understood that both audible and visible signals shall be used, when possible to obtain them.

If I were a brakeman, I should want to hear the engineman of the train which I was flagging answer my cautionary signals, as well as the stop signals.*

Certain changes in Rule 101 seem desirable; and I would write it thus:

"101. If a train should part while in motion, trainmen and enginemen must, if possible, prevent damage to the detached portions. The signals prescribed by Rules 12 (d) and 14 (f) must be given, and the front portion of the train kept in motion until the detached portion is stopped. The front portion will then go back, to recover the detached portion, running with caution and, if necessary, following a flagman. The detached portion must not be moved or passed until the front portion comes back.

"Under circumstances where the front portion can be side-tracked, it should be done, and the engine return light for the detached portion."

Code Rule 101 was formulated before air-brakes came into general use, and it is now sometimes modified. When a train can be controlled by the air-brake from the engine to the caboose, the engineman makes no effort to pull the front portion away from the portion next in the rear, but, instead, allows the front part to stop at once, in order to prevent a widening of the breach. It is not difficult to read into the present rule authority for doing this, without making any change therein; but some companies, notably the Rock Island, have referred to this contingency and prescribed by rule what shall be done. As the grade, and the possibility of the air bleeding off, or not working through a train, owing to tramps riding between cars and tampering with angle cocks, must always be taken into consideration, I do not care to make any recommendations in this direction, believing it to be unsafe to do so.

"103. Instructions respecting the movement of trains, or the condition of track, roadway or bridges, must be in writing."

The following rules, selected at random from several books, are all worthy of careful consideration before passing to another chapter. As their value is apparent, it is only necessary to print them:

"The movement of 'dead' engines requires that great care be exercised to avoid damage to track or bridges. When practicable, they should have all side rods in proper position, and in no case will they be forwarded until after a thorough understanding between the Superintendent and the Master Mechanic. They must be in charge of a competent man, who must frequently advise the conductor as to their condition." (Speed regulations for different kinds of engines, having a part or all of the rods off, may follow in another paragraph.)

"When handled in freight trains; steam shovels, rotary snow excavators, derricks, pile drivers, gun truck cars, cars upon which are loaded long girders, and twin loads, must be moved at a speed that is perfectly safe."

"Trains running from main line to a branch must clear the main line immediately on arrival at junction station, pulling in on branch track at initial switch. In the opposite direction, they must not occupy the main line until after station work is done and they are ready to leave. Must protect, as per Rule 99, against main line trains while doing work at junction stations."

"Special instructions will be bulletined in books provided for that purpose at designated points. Conductors and enginemen must examine all bulletins before starting on each trip and acknowledge notice by signing their names in place provided therefor."

"At meeting and passing points, or when trains are standing at the end of double track waiting for expected trains, the employe tending the switch, must, after locking it for the track to be used by the expected train, take position on the opposite side of track from the switch-stand and remain there until the entire train or trains have passed, and carefully observe the signals displayed by such trains.

"Employees must get on or off train or engine on opposite side from switch-stand, except when going ahead to open a switch, or boarding the train after having closed it."

"When a train is backed in on a siding to be met or passed by another train, the engineman, when engine is in to clear, must see that the switch is set for the main track. Enginemen must know that switches are properly set for their train before pulling into or out of a siding or other tracks."

"At railroad crossings at grade, where the view is obstructed and there are no signalmen or interlocking plants, one of the crew must precede the train and give signal from the crossing, if safe to proceed."

"Unless under control, no train may pass another which is standing at a station to receive or discharge passengers. The whistle must be sounded and bell rung by the approaching train. Trainmen and station employes must make every effort to keep persons off the track and warn them of the risk they run in attempting to cross the track in front of a moving train."

"Accidents, detentions, shortage in the supply of water or fuel, defects in track or bridges, fires, rapidly rising streams, sliding embankments or cuts, and heavy rain or snow, or rock or earth slides, liable to cause accidents or obstruction, must be promptly reported to the superintendent, and the person making the discovery must also take the necessary steps to fully protect trains, until the matter is taken care of by the superintendent."

"Conductors and enginemen must show all train orders to brakemen and firemen."

MOVEMENT BY TRAIN ORDERS.

"201. For movements not provided for by time-table, train orders will be issued by authority and over the initials of the ————. They must contain neither information nor instructions not essential to such movements; must be brief and clear; in the prescribed forms when applicable; and without erasure, alteration or interlineation."

"205. Each train order must be written in a book provided for the purpose at the office of the ————; recording the names of those who sign for it; the time and signals which show when and from what offices the order was repeated; the responses transmitted; and the train dispatcher's initials. These records must be made at once, and never from memory or memoranda."

"206. Regular trains will be designated in train orders by their numbers, as 'No. 10,' or '2d No. 10,' adding engine numbers if desired; extra trains by engine numbers, as 'Extra 798,' with the direction, as 'East' or 'West.' Other numbers and time will be stated in figures only."

To omit to give the direction of an extra train is often confusing, and the labor saved in not always doing so is so infinitesimal that I am surprised that the committee ever countenanced the practice.

"207. To transmit a train order, the signal '31' or '19' must be given to each office addressed, indicating the number of copies required, if more or less than three—thus, '31 copy 5,' or '19 copy 2.'

When the semaphore form of train order signal is provided, it is not a bad plan for the despatcher to also indicate the direction in which the train is moving that it is desired to have the operator copy the order for. For a further illustration see the change proposed in Rule 221 (B).

It is now thought best by some companies to address all orders in duplicate to the operator at whose stations trains are to meet, or are to wait until a certain time for an inferior train. This has lately been termed the "Middle Order" method. My views on this way of safeguarding trains, as well as blocking them absolutely, are too well-known to require mention here.

When the operator at the meeting point is given a copy of the order, Rule 208 is changed to read:

"208. A train order to be sent to two or more offices must be transmitted simultaneously to as many of them as practicable.

*This rule is discussed at length in Mr. Forman's book "Rights of Trains on Single Track."—Editor.

The several addresses must be first to the operator at whose station the trains are to meet and next in the order of superiority of trains, each office taking its proper address. When not sent simultaneously to all, the order must be sent first to the superior train.

"Copies of the order addressed to the operator at the meeting point must be delivered to all trains affected until all have arrived from one direction, when, if there are no other orders in effect at that station, the train order signal must be changed to 'proceed.'

"Orders addressed to operators restricting movement of trains must be respected by conductors and enginemen the same as if addressed to them."

It occurs to me that it would be well for the Train Rule Committee to recognize the "Middle Order" plan for moving trains, by inserting two Rules 208; the present one to be known as "208 (A)," and one similar to the above to be "208 (B)."

When the normal position of the order signal is at "stop," a part of the second paragraph of the above rule may be omitted.

Rule 210 is often unfavorably commented upon; there being no provision for showing whether or not an order which has been completed and delivered to a conductor ever reaches his engineman. Should the engineman forget the order and, to escape discipline, destroy it, what evidence can the conductor produce to show that he delivered the order to him, if the engineman sees fit to declare that such an order was never placed in his hands? There may have been other orders handed to the engineman at the time, which would fully clear his train from the order signal. The Clearance Card does not show how many orders are completed for a train, nor are cards always delivered with orders.

The last sentence in the second paragraph of Rule 210, as printed in at least one book of rules which I have by me, is very puzzling. It reads "The copy for each engineman must be delivered to him personally by the operator, conductor or brakeman." And the last sentence of Rule 211 in the same book reads, "The operator receiving this response will then write on each copy the word "complete," the time, and his last name in full, and personally deliver a copy to each person addressed without taking his signature."

Thus it will be seen that when two orders are sent for a train at the same station on that road, one being perhaps a "31," restricting the train for an opposing train at some blind siding beyond, and the other a "19" conferring "right," the operator, conductor or brakeman may take the "31" to the engineman, while the "19" order, which may only help the train, and which it must have to enable it to proceed, must be delivered to the engineman personally by the operator, notwithstanding the engineman may be some distance from the office and the operator ought not to be spared from other duties long enough to make the delivery. I happen to know that on that road the "19" orders are also sent to the enginemen, when necessary, by the conductor or brakemen. They found the code rule to be impracticable after a few days' trial and had to make a change in the practice by inserting a special rule in their time-tables.

Which is the most sensible course to pursue: to make workable rules at the beginning, or adopt some which are known to be impracticable, and then wink at violations of them? Or be obliged to nullify them in part by bulletin or time-table?

Unless many unnecessary delays are to be endured and explicit instructions violated there would appear to be but two ways to strengthen these rules and make them more practicable: The last sentence of Rule 210 may be changed to read, "The copy for each engineman must be delivered to him personally by the conductor, and he shall acknowledge receipt of same by endorsing his name on the copy retained by the conductor." The last paragraph of Rule 211 may be changed to read, "When necessary engineman's copy may be delivered by conductor. In such cases, conductor must endorse his name on the copy which is to be retained by the operator, and engineman must sign conductor's copy."

It is not best to allow brakemen to deliver orders, as they may not be able to reach the engineman, while the conductor may think that the orders have been delivered and place too much dependence thereon.

As to the "19" form of train order, it is, of course, nearly always possible to issue a "31" instead when the engineman is out of reach of the operator, but this practice is not always followed.

The other way to make these rules safer and more practicable, and a method that is being used quite extensively, is to deliver a clearance card with all orders, stating thereon the numbers of the orders which were received for the train. Enginemen and others can then quickly note whether or not all orders intended for them have been received. Such a Clearance Card may read as follows:

Form.....

CLEARANCE CARD.

The Missouri Pacific Railway Company.

Date.....1905. Time.....M.

Station .....

Conductor and Engineman .....

Herewith Orders No.....

I have ..... orders for your train.

Order Signal is displayed at stop for.....

This does not interfere with or countermand any orders a train may have received.

Conductor and Engineman must each have a copy of this form and see that their train is correctly designated therein. They must check the numbers of their orders against those shown above.

If there are no orders for a train, operator must write the word "No" in the blank space provided; if orders are delivered to a train, operator must use the words "No Further."

The Code Clearance Card reads "Signal is out for ———." Whenever I read that line I am reminded of the story about the new and inexperienced night operator. When he had repeated his first order the despatcher asked him if his signal was out. He replied that it was not. Despatcher instructed him to put it out. The operator climbed the signal post, blew out the light, and then advised the despatcher that now his signal was out.

As fixed signals must always indicate stop, caution or proceed it may be said that they are constantly displayed—not out—and the line in question should read "Order Signal is Displayed at Stop for ————," if, indeed, such information is needed on the card at all. If the entire line were omitted from the form it would assist in simplifying matters without appreciable additional risk.

Some companies add to Rule 211: "A '19' train order must not be sent to a superior train restricting it for an inferior train in the opposite direction, unless first addressed to the operator at whose station the trains are to meet and issued for the superior train before it reaches such station."

"216. For train orders delivered by the train despatcher the requirements as to the record and delivery are the same as at other offices.

"Such orders shall be first written in manifold so as to leave an impression in the record book, from which transmission shall be made."

The second paragraph of this rule is hardly practicable and should be omitted. The despatcher may require the conductor to read the order aloud while he underscores the copy in his book, the same as if it were repeated to him by an operator out on the road. Orders are not entered in the despatcher's book in the same manner that they are written on manifold.

Code Rule 218 reads:

"When a train is named in a train order, all its sections are included unless particular sections are specified, and each section included must have copies addressed and delivered to it."

I prefer the following:

"218. When a train is named in a train order by its schedule number alone, all its sections are included, unless particular sections are specified, and each section included must have copies delivered to it. When practicable, sections will be specified."

The code rule is misleading in that it requires each section to "have copies addressed and delivered to it." Often operators have understood this to mean that they must destroy the order as originally addressed to No. 1 and make a new copy, addressing it to the several sections of No. 1. But this is not what should be done and to allow such an inference may result in accident, as the operator may fail to address the new copies to all the sections.

The code rule should read "and each section included must have copies delivered to it." Rule 218 is necessary and a very good one theoretically; but after having witnessed several accidents under it, on account of operators failing to deliver a copy of the order to any except the first section, it is my conviction that it should prescribe that sections shall be specified when practicable. If I were to give a freight train an order that No. 1, a first class train, would run one hour late, when there were two sections of No. 1, and the freight should overlook the signals on the first section and collide with the second section, I should feel as though I was in a measure responsible for the accident by having sent a misleading order.

"220. Train orders once in effect continue so until fulfilled, superseded or annulled. Any part of an order specifying a particular movement may be either superseded or annulled.

"Orders held by or issued for a regular train become void when such train loses both right and class as prescribed by Rules 4 and 82, or is annulled."

The second paragraph of the above code rule fails to fully meet every condition. If a train is directed by order to meet No. 1 such order may be disregarded after No. 1 loses right and class; but one gets the impression that the order becomes void only for the train which becomes 12 hours late, or in other ways loses its schedule. Again, men have been known to destroy orders which they were holding to be delivered to another train when they (the bearers) lost their own schedule.

The following rule seems to more fully and clearly provide for every contingency:

"220. Train orders once in effect continue so until fulfilled, superseded or annulled. Any part of an order specifying a particular movement may be either superseded or annulled.

"When a regular train loses its schedule, as prescribed by Rules 4 and 82, or when it is annulled, all orders (or any part of an order) issued for or relating to it become void."

The first paragraph of Rule 221 (A) reads:

"221. (A). A fixed signal must be used at each train order office, which shall indicate 'stop' when there is an operator on duty, except when changed to 'proceed' to allow a train to pass after getting train orders, or for which there are no orders. A train must not pass the signal while 'stop' is indicated. The signal must be returned to 'stop' as soon as a train has passed. It must be fastened at 'proceed' only when no operator is on duty."

When there are several trains at a station, and the operator wishes to release one and hold the others, it would be much better to provide a way for him to do so by clearance card, rather than to compel him to change his order signal to "proceed." When there is no risk in changing the signal, he may do so if necessary to avoid stopping an important train. The second sentence might be

changed to read "While 'stop' is indicated, trains must not pass the signal without a Clearance Card, Form ———."

As the engine and some of the cars must often pass the signal to do work at the station platform, or to clear the main track for other trains, it may be understood that this refers to the men in charge of the train, not to the engine and cars.

The second paragraph of Rule 221 (B) reads:

> When an operator receives the signal "31," or "19," he must immediately display the "stop signal" and then reply "stop displayed"; and until the orders have been delivered or annulled the signal must not be restored to "proceed." While "stop" is indicated trains must not proceed without a clearance card (Form ——— (A))."

Now that there are so many semaphore train-order signals, it would be better to change this paragraph to read:

> When an operator receives the address of an order he must immediately display the "stop signal," and before repeating or "X-ing" the order must reply "S. D.," meaning stop displayed; and until the order has been delivered, annulled or becomes void the signal must not be restored to "proceed." While "stop" is indicated, trains must not proceed without a Clearance Card, Form ———

This would enable an operator to avoid stopping many trains unnecessarily, that is, provided he complies literally with the code rule, which I doubt very much is always done.

In Rule 223 the abbreviation for "minutes" is "mins.," while in the examples "min" is made use of. This is doubtless only an oversight, but it should be corrected. "Mins" would seem to be the proper way to put it.

(To be continued.)

Reinforced Concrete Highway Trestle in Atlanta.

Edgewood avenue, Atlanta, Ga., carrying a double line of electric car tracks, crosses over the tracks and yard of the Southern Railway at about 30 ft. elevation. Up to last summer the main tracks were spanned by lattice or plate girders, while the approaches on either side were of wood, in the ordinary style of trestle work. The east approach has been replaced this past winter by a reinforced concrete structure of novel design but exceedingly substantial construction. This approach is approximately 140 ft. long. It is divided into panels about 22 ft. long on centers, each panel having three posts spaced 21 ft. apart on centers. Additional posts are under the curve of the sidewalk, which projects 9 ft. on each side.

A Reinforced Concrete Highway Trestle.

Details Showing Posts and Bracing Members.

The ordinary style of construction would have provided piers at regular intervals, extending the full width of the street; but the structure is actually built with posts 21 ft. apart on centers transversely, and about 22 ft. apart longitudinally. The east abutment is a skeleton concrete structure, reinforced with iron rods, and having a light appearance. The next two bents have 18-in. x 18-in. posts of concrete, unbraced and unconnected except by the floor. Beyond this the posts are 14-in. x 14-in. and are divided into two stories by 8-in. x 12-in. horizontal girts and transverse struts connecting them at about 15 ft. below the floor level. In the plane of each bent there are diagonal members which alternate with each other, the tops in one bent being at the center post, and in the next bent at the outer posts. The sidewalk is carried on concrete brackets built on the outer side of the outer posts, and both of these rows of posts are connected at the tops, longitudinally by segmental arches, the top line of which makes the curb stone of the street. Each bent is capped by a concrete girder 14 in. wide and about 30 in. deep, or projecting 24 in. below the floor. Built into these caps are four lines of longitudinal stringers 12 in. wide and about 22 in. deep, one under each track rail, and there is an additional stringer of the same size spaced about midway between the outer rail and the curb stone.

The concrete floor is built to the proper level for the street surface, and the roadway is laid with creosoted paving blocks on a heavy sand cushion. The sidewalks are of hexagonal concrete flag stones or tiles about 1¾ in. thick by 18 in. diameter, set in concrete. The longitudinal and transverse struts and all of the diagonals are connected with the posts by concrete gussets, and all of the posts, ties, struts and braces are finished with a 2-in. by 2-in. bevel on the corners, and contain iron rods.

The sidewalk is protected by a balustrade built of concrete over a skeleton of iron rods and woven wire work. It is divided into panels about 5 ft. long by post projections, and has a substantial concrete base construction as an outer girder, connecting the ends of the brackets which support it. The hand rail on the top of the balustrade is 10 in. wide by 5 in. deep, and contains two ¾-in. rods. The base of the balustrade or girder referred to above is 17 in. deep by 10 in. wide, and also contains rods. The center of the panel is reduced by off-sets at the base, posts and hand rail to 4 in. in thickness.

The foundation of the structure is on the ordinary soil, using a broad base and reducing by offsets to the size of the post below the surface of the ground. No piles were used, as it would have been difficult if not impossible to drive them through the old structure. No provision for expansion or contraction due to changes in temperature was made. The structure being of reinforced concrete, this could be omitted with safety.

All the molds were made of undressed lumber, leaving a rough surface to the concrete, and this, where finish was desired, was coated with a mortar, or otherwise treated. In some cases a rough finish was made by spattering the surface with fresh mortar. Centers of panels have such a finish. Posts and braces and heavy members have only the rough finish which would be given by the surface of rough lumber, but are not displeasing.

The structure is noteworthy because of the boldness of the design in supporting the whole structure on posts and relying on horizontal, longitudinal and transverse bracing with transverse diagonals and longitudinal arches to stiffen the construction.

The Strike in New York City.

The strike of the employees of the Interborough Rapid Transit Company, of Manhattan, New York City, March 7, was seen to be a failure from the first, as was indicated in these columns last week; and within two or three days the leaders of the strikers were themselves convinced of the fact. The train service on the subway lines was almost entirely restored by the third day (Wednesday, March 8), though there was still much delay, resulting in crowding of passengers and occasional disturbances and slight accidents, in consequence of the limited experience of the new men and the rigid limitation of the speed of trains. The train service on the elevated lines was not so promptly restored, the aim of the officers having been, evidently, to restore the service on the subway as promptly and as fully as possible, even at the expense of neglecting to some extent the service on the elevated lines.

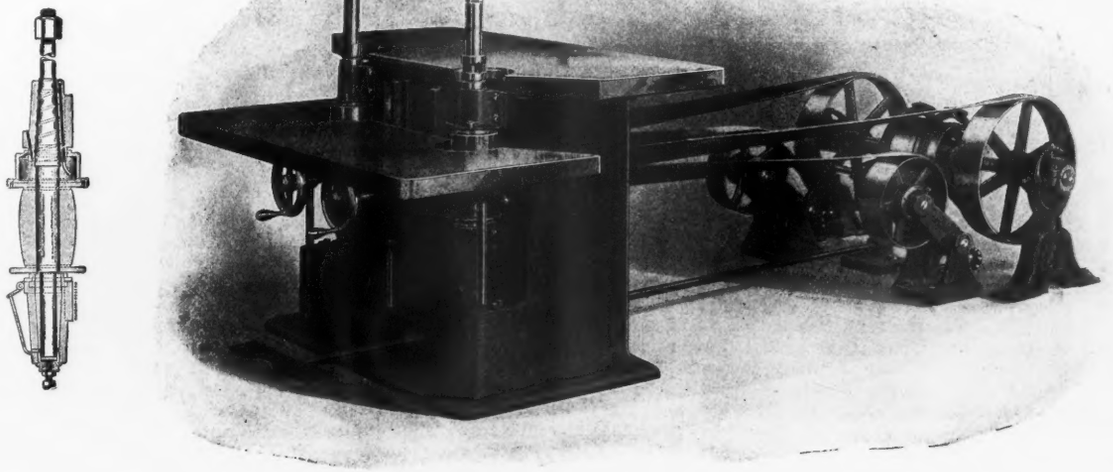
For the first few days the work of organizing the new forces was facilitated by the smallness of the volume of traffic. Passengers being in doubt as to what delays might be suffered in the subway, continued to travel by the surface street cars. But as the normal traffic began to return to the Interborough lines the passengers' troubles increased, and on Monday, the 13th, the sixth day after the strike, the delays and accidents were more numerous than on any other day. A number of slight collisions occurred, but none after March 7 with very serious results. Cases of assault and disorder were also very few and, on the whole, the police kept the situation well in hand. On the 9th, Grand Chief Engineer Stone, of the Brotherhood of Locomotive Engineers, summarily revoked the charter of the New York division of that brotherhood, thus expelling all of the strikers who had belonged to that union. It is said that all these men lose the moneys which they have paid in to the insurance department of the brotherhood.

The total number of men employed by the Interborough was 7,000; of these about 2,000 continued in their places, and on Saturday the management of the company voted to give them all two weeks' extra pay. By Tues-

day of this week about 1,000 of the strikers had been taken back as individuals, losing their seniority. The officers announce that the rule under which new employees must be less than 40 years old was, and will be, strictly enforced against the strikers. The rule prohibiting the use of intoxicating liquors will also be rigid, and in general the superintendents will take back only the best of the former employees, and these only as vacancies occur. The new men have been assured of permanent tenure, provided their work is satisfactory. One of the lieutenants of Mr. Farley says that the "strike-breaker" brought to New York about 4,500 men. It appears that about all of the strikers have asked to be re-employed. Some of them are not union men. These and many others say that they struck because they feared to antagonize the majority; and the majority appears to have been misled by extraordinary and unfounded claims, on the part of the leaders, that the Interborough could be made to grant about anything that was demanded.

A Two-Spindle Upright Moulding Machine.

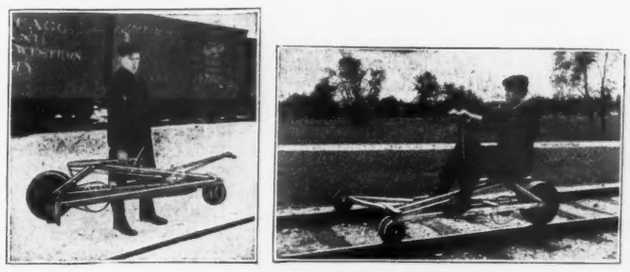
The accompanying illustration shows a two-spindle upright moulding machine, or shaper, made by the S. A. Woods Co., Boston, Mass. The table of this machine is made in two sections. The front section of the table is vertically adjustable and can be lowered 7¾ in. below the level of the fixed table. The machine is compact and is heavily made so as to withstand the strain of high speeds and deep cuts. The drop table, which is patented, provides for a wide variety of work and allows the cutters to be set close to the boxes, thus obviating vibration. The small sectional cut shows the construction of the spindles used on this machine. Both spindles can be lowered below the level of the fixed table and the maximum height of the spindles above the drop table when the table is in its lowest position is 17½ in. The fluting of columns and forming of irregular mouldings, not possible on ordinary machines of this type, are thus easily handled. The patent bronze boxes have great oil capacity and the forced lubrication insures cool bearings at the highest speeds. Belt tighteners which are provided with the counter shaft equipment keep the belts under the proper tension.



A Two-Spindle Upright Moulding Machine.

The Red Cross Railroad Velocipede.

The "Red Cross" railroad velocipede illustrated herewith combines extreme lightness with strength. It is claimed that it weighs less than one-third as much as any other design, its weight being 52 lbs. It is capable of carrying three men and can be driven at high speed, it being possible to attain from 30 to 40 m.p.h. with it. It is collapsible, the removal of one thumb-nut enabling it to be folded up so as to occupy a floor space of 12 in. x 24 in. When folded in this way it can be carried in one hand, and may again be put in operating condition in half a minute. It is made entirely of second growth ash and pressed steel, and has ball-bearings, to give a maximum of strength with a minimum of weight and enable the greatest ease of propulsion. The motion of propulsion is entirely within the control of the operator; the stroke may be long or short, quick or slow. Also, control of the speed is positive and absolute. It is made by E. T. Harris, 531-545 West Fifteenth street, Chicago.



The Red Cross Velocipede.

Judge Grosscup on Federal Regulation of Railroads.

Whatever may be its legal status, a policy of discrimination that gives to one set of persons in a community rates that are refused to the balance of that community, or to certain communities rates that are refused to other communities, is a policy of injustice—unjust both to the persons and communities discriminated against, and unjust to the people of the United States as an entirety. And this injustice is one that it is the business of our people, as a nation, to look after; for, practically, it is armed intervention, by the railroads of the nation, that in these days of small profits turns the fortunes of the contest.

Any difference in rates permitted by law, even though based on the bulk of the tonnage handled [using the "wholesale" principle] is a direct and effective blow by the nation itself at the principle that every man, whatever his present business size, shall be given equal conditions and equal opportunity. To destroy that principle is to destroy competition and further concentrate wealth in fewer hands.

No one ought to be more deeply interested in the agitation now going on than the railroad men themselves. The agitation—at least, so far as it is a sane agitation—is not against the railroads. The agitation is against abuses that have grown up, with which the railroads are connected. The farmer, for instance, is not the enemy, naturally, of the railroads. He recognizes in the railroad the strong arms that hold him and his interests close to the throbbing pulse of the world's activities. Nor is the manufacturer the railroad's enemy, naturally; nor the merchant, nor the sane minded public. The only natural enemy of the railroad is that class who toil not, neither do they spin. Nor is the agitation new. It was not new 18 years ago, when the Interstate Commerce bill was passed.

What is new in the present agitation is that at its head is the President of the United States. What is new in the present agitation is that the people of the United States, regardless of their interest individually as shippers, have come to look on the subject as a national concern. And what is new in the present agitation, and full of danger, too, is that from its being a question of the proper relation of the railroads to the public on business and political principles, it may become a movement under cover of which the social and political revolutionists will push forward their assault on

the present order of American institutions. Already they are climbing over the wheels into our conservative President's wagon, determined to ride just as far as he is compelled to carry them on his way to a just solution of this problem. Already they are claiming this whole movement as their movement. Herein lies the embarrassment and the peril of the President. Right here, too, rises that grim menace, that no friend of the institution of private property anywhere can afford longer to ignore.—*Speech at Boston, March 10.*

Coaling Barrow for Locomotives.

The simplest type of coaling station is where the coal is delivered on an elevated platform, loaded into barrows, carts or buggies, trucked to the edge of the platform and dumped directly into the tenders, the platform being about the level or slightly above the top of the tender. A type of barrow for this purpose is shown herewith. It is 9 ft. long, 30 in. wide and 30 in. deep, weighs 860 lbs. and has a capacity of 38 cu. ft. The sides are No. 12 steel and the bottom No. 10. The axle is 2 in. x 2 in. with 4-in. drops. The wheels are a special construction. They are wrought iron with ¾-in.

Archer Barrow for Coaling Locomotives.

round spokes, each three of which are welded together at the hub end, the other ends being riveted securely into the rim. The wheels are 44 in. in diameter and the tires are 1½ in. x ⅜ in. The hubs run on roller bearings and are 12½ in. long, minimizing the possibility of the barrow upsetting. The third point of support is a 9-in. swivel wheel. One man can handle a ton of coal in one of these barrows without difficulty. They are made by the Archer Iron Works, Chicago, which also makes 34 different styles of all-steel barrows for contractors' purposes. During the past few months one railroad has given five different orders for lots of the coaling barrows.

Supplying Electric Current for Interlocking Plants.

BY C. C. ANTHONY.

The operation of automatic block signals by storage batteries, either portable or arranged to be charged through a line circuit, has recently attracted so much attention that a description of a method of supplying current to interlocking switches and signals may be of interest. In the case of automatic block signals which are distributed along the road at considerable intervals, the method naturally developed is to use generators of the highest allowable e.m.f. and from each generator charge the cells in series over as great a length of road as possible; the limit of distance is, of course, that over which the voltage of the generator will barely send sufficient charging current through the number of cells and the line resistance in that distance. From considerations of the effect on other lines on the same poles and the safety of linemen and other employees who are likely to be inexperienced in dealing with high potentials, a maximum e.m.f. of about 500 volts, which has the further advantage that machines for that e.m.f. are commercial sizes, has commonly been adopted.

For the supply of current to interlocking and non-interlocking (push-button) switch plants, more especially electro-pneumatic plants, which require but a low voltage, sets of cells of the proper number, arranged to be charged on the charging circuit of the automatic signal system, where such a circuit exists, are sometimes satisfactory. But if there are several such plants of different sizes to be provided for it is apt to be difficult to adapt the various requirements for current to the fixed charging rate imposed by a series charging line; moreover, by the gradual addition of batteries required by new interlocking plants or enlargement of existing plants within the block signal limits, there is a tendency to overload the charging circuit, thus reducing the charging current more than is desirable.

Where current for lighting and power is within reach it can be utilized to great advantage with a motor-generator at each plant to supply the low voltage needed; in this way each plant can take the amount of current required, independently of the others. If the primary current obtainable is alternating it may be possible to use stationary rectifiers instead of rotating motor generators. At the present time these devices are coming forward commercially and apparently promise to afford a means of converting alternating into direct-current that will require little attention and even, possibly, suffer little wear or consumption of materials. Preparations are now under way to try them on interlocking circuits.

If there is a constant service, day and night, on the primary circuit, it is a very good plan to have the motor-generator run constantly and supply current directly to the plant with a storage battery "floating" as a reserve source of current when the generator is stopped. It is sometimes thought that the constant running of a motor-generator means a serious waste of power, but it is easily seen that, if a certain amount of electrical *energy* is to be supplied to a plant in a day, it makes little difference whether a generator is supplying a small current during the whole time or generating a large current (to charge a storage battery) part of the time and standing idle part of the time.

The only possible gain by the latter plan would come from the greater efficiency of the generator when running at full load (assuming that the same machine is used on light load in the former case); but this gain would probably be offset by the losses in the batteries when used as the regular source of current for the plant and alternately charged and discharged.

If the current consumption of a plant fluctuated largely and if there were periods when little or no current was being used (the conditions likely to exist at an electric interlocking plant), it might be preferable to take current from storage batteries charged at intervals. But where a considerable amount of current is constantly flowing the constantly running motor-generator with battery in reserve is a very satisfactory arrangement. The very moderate attention required by the battery is a particular advantage. The repairman must keep the voltage of the generator at such a point, by means of the field rheostat, that the battery shall not, on the whole, have more discharging than charging and so gradually reach so low a state of charge as to be useless when it is wanted; but this he can easily manage by glancing from time to time at the (center-zero) ammeter in series with the battery and noting whether the pointer stands too much on the discharge side of the zero. Aside from this all that is necessary will be occasional but regular tests of specific gravity and voltage, to determine whether anything is going wrong in any of the cells, and occasional partial discharges of the battery followed by full charging ("working the battery"), a treatment that is recommended to keep the elements in their best condition. Generators having an output of 25 amperes at 25 volts, direct-connected to suitable motors, have been found satisfactory although somewhat smaller machines are quite sufficient for small plants.

The following arrangement of circuits has been used: One pole of the generator and the corresponding pole of the battery are connected directly to the main return wire of the plant. A small dead resistance (an ohm or less) of ample current-carrying capacity is placed in series with the other generator terminal and a similar resistance in series with the battery. The generator and battery circuits, after passing through these resistances and the instruments, are then brought together at a common connection to the main feed wire for the plant. A fuse of liberal capacity is placed in the generator branch of the circuit to protect the machine against damage by a short circuit; in the same branch an ammeter is placed and a center-zero ammeter is in the battery branch.

A voltmeter has one terminal connected permanently to the common return wire (to which the generator and battery are directly connected); the other, by means of a simple lever switch, can be connected to the other side of the generator or battery or to the main feed wire for the plant, so that the e.m.f. of the generator and the battery, and the actual difference of potential operating the plant can be found at any moment. Finally the generator has an automatic circuit breaker or underload switch in its branch of the circuit to prevent the battery from discharging through it in case it stops or falls off in e.m.f. A simple electro-magnetic switch with mercury contacts, having a very low resistance winding through which the current from the generator passes, is very satisfactory. When current ceases to flow from the generator this switch opens the circuit and prevents any back flow. At the same time back contacts, with which it is provided, shunt the small dead resistance, previously mentioned, in series with the battery, so that, if the generator is out of service for a considerable time and the e.m.f. of the battery falls somewhat on discharge, the resistance will not prevent the supply of sufficient current to the plant.

The dead resistances in series with the generator and battery serve to steady the current flowing through the battery and prevent the large fluctuations that would result from small changes in the generator e.m.f. if the generator and battery were directly connected; at the same time they limit the flow of current from both generator and battery when a short circuit occurs on the plant. It is debatable whether fuses in the various operating circuits leading out from an electro-pneumatic interlocking machine are desirable. There are, of course, various degrees of "short circuits," depending on the nature of the accidental contact causing the short circuit and the wire resistance between the contact and the battery or generator. If no fuses are used a "dead" short circuit may

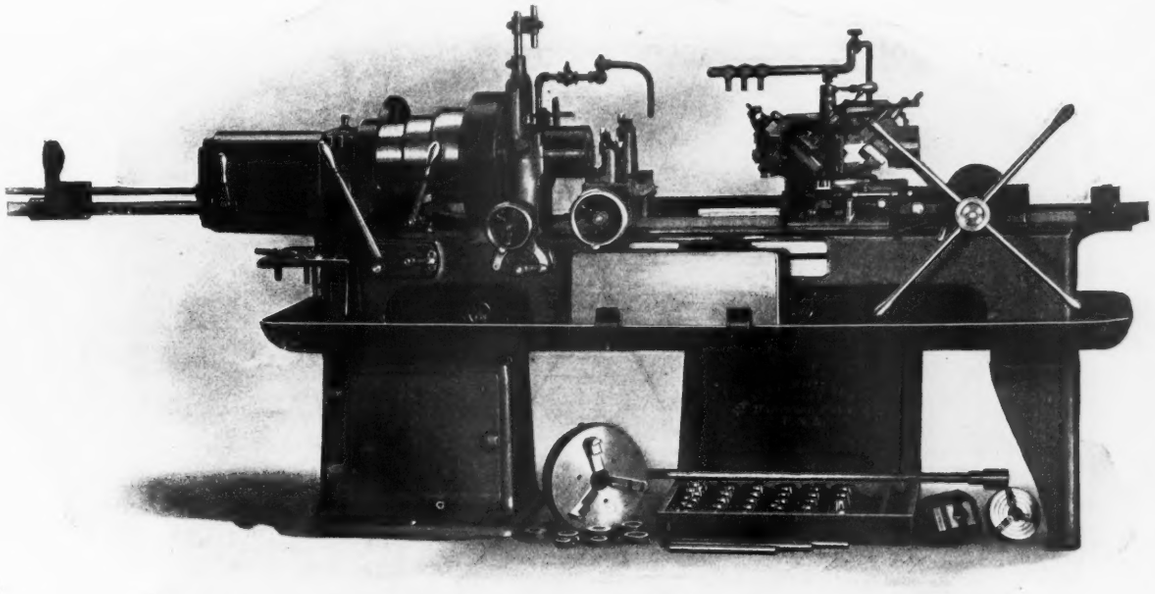
do some slight damage by heating conductors or burning contacts and will cause such a drop of potential as to throw all the circuits of the plant out of service. But a partial short circuit may merely cause a considerable increase of current, to which the high readings of the ammeters should soon call attention, and may interfere little or not at all with the working of the plant; the trouble can then be located by testing, and removed. On the other hand the numerous fuses required, and their connections, would seem likely to be the cause of a good many unnecessary failures to offset the occasional benefit derived from some of them; although it might be possible to have them of such reliable construction that open circuits would be very rare. Actual experience at a considerable number of plants goes to show, however, that very satisfactory results are had without the use of fuses.

There are frequently several short track circuits at an interlocking plant; supply of current to these can conveniently be taken from the main feed wire of the plant through suitably high resistances. This arrangement is somewhat wasteful of electrical energy since the current cannot be materially reduced to offset the high voltage used; but there is a saving when the track is short-circuited by trains as the current then is but little greater than it is at other times, while, with a low voltage and low resistance, the current on short circuit is, of course, many times greater. The advantage of the method is its simplicity in comparison with a considerable number of separate storage cells for the various track circuits, with the necessary connections and switches for charging and discharging them. On the other hand there is no doubt that long track circuits should be provided with separate cells as, when several are supplied from one battery, the leakage is apt to be excessive and there seems to be increased liability to failures on the dangerous side resulting from stray currents in the earth. The necessary cells for such circuits adjoining an interlocking plant can be charged from the motor-generator, giving 15 or 20 volts, through a local charging line.

At push-button switch plants the circuits are of the greatest simplicity. The indicators, which now lock the push buttons and prevent the switches from being thrown under cars, are worked directly from the track circuits without relays, and these circuits are fed from the generator through high resistances connected to the main feed wire of the plant and through direct connections to the common return. At a number of interlocking as well as push-button plants the arrangement of circuits and method of supplying current described has given very satisfactory results in practice.

The Pratt & Whitney Turret Lathe with Special Equipment for Locomotive Work.

The accompanying illustration shows the 2-in. x 26-in. Pratt & Whitney turret lathe. This machine is especially useful in the locomotive shop for turning bolts. All ordinary bolts can be turned without any special equipment, but for turning the long taper bolts used in locomotive frames a special taper turner is provided, which is usually arranged for a $^1/_{16}$-in. taper per foot.



The Pratt & Whitney Turret Lathe.

Another class of bolt work for which this machine is adapted is for centering and turning forge bolts, the heads of which are more or less eccentric. A lever scroll chuck is mounted on one of the turret faces and in it the body of the bolt is placed. The shank of the forging chuck, which has two floating jaws, is placed in the regular chuck jaws in the spindle. The turret is then run forward, and the bolt, the body of which is held in a scroll chuck, is run into the forging chuck and the jaws tightened on its head. The scroll chuck is then opened, the turret run back and indexed to the first turner required, and the turning proceeded with. The fact that the bolt is held in the scroll chuck while it is being clamped by the forging chuck ensures the bolt being centered absolutely correctly.

The regular equipment of this machine includes a full set of chuck jaws from ¾-in. to 2-in. in diameter, handling round, square and hexagonal stock; three universal turners which have radial adjustment so that besides for ordinary turning they may be used for facing off the heads of bolts, etc.; one open side turner for bolts and pin-heads above 2 in. in diameter; one taper turner; one bell-mouthed pointing tool; one self-opening die head with roughing and finishing attachment, with full set of thread dies; $^1/_{16}$-in. lever scroll chuck; one forging chuck; one 12-in. combination lathe chuck; bushings, collars, rod supports, etc. It will be seen from the above list of tools that this machine is adapted for a wide variety of engine lathe work, and it will do this work in a fraction of the time required on an engine lathe. The double cross slide on Pratt & Whitney turret lathes is of particular value, as it enables work to be cut off while turning is in progress, and it is also adapted to hold heavy forming tools.

Enforcement of Automatic Coupler Law.

In the suit of the Government against the Southern Railway for violating the Safety Appliance law, which was decided at Springfield, Ill., March 2 (reported in the *Railroad Gazette* of March 10, page 73, General News section), the court held as follows:

(1.) The car, being loaded with coal from Illinois for Missouri, was moving in interstate traffic, though the Southern did not haul it from one state to another.

(2.) It is no defence to show that the company had equipped the car with the required safety appliances and that it had exercised reasonable diligence to keep them in repair.

(3.) The *use* of a car that could not be uncoupled from the next car without the necessity of men going between, is forbidden by the act.

(4.) The act was to secure the "safety of employees" and must be so construed as to accomplish its purpose.

(5.) Putting a Master Car Builder's defect card on the car when sending it to another road does not relieve the company; the use of the card is such a deliberate violation as to amount to a defiance of the law.

The defect in this car was an uncoupling lever which would not work. It was discovered by the Government inspector at East St. Louis, Ill., and after the discovery the car was moved two miles to a junction with the Terminal Railroad. The inspectors of

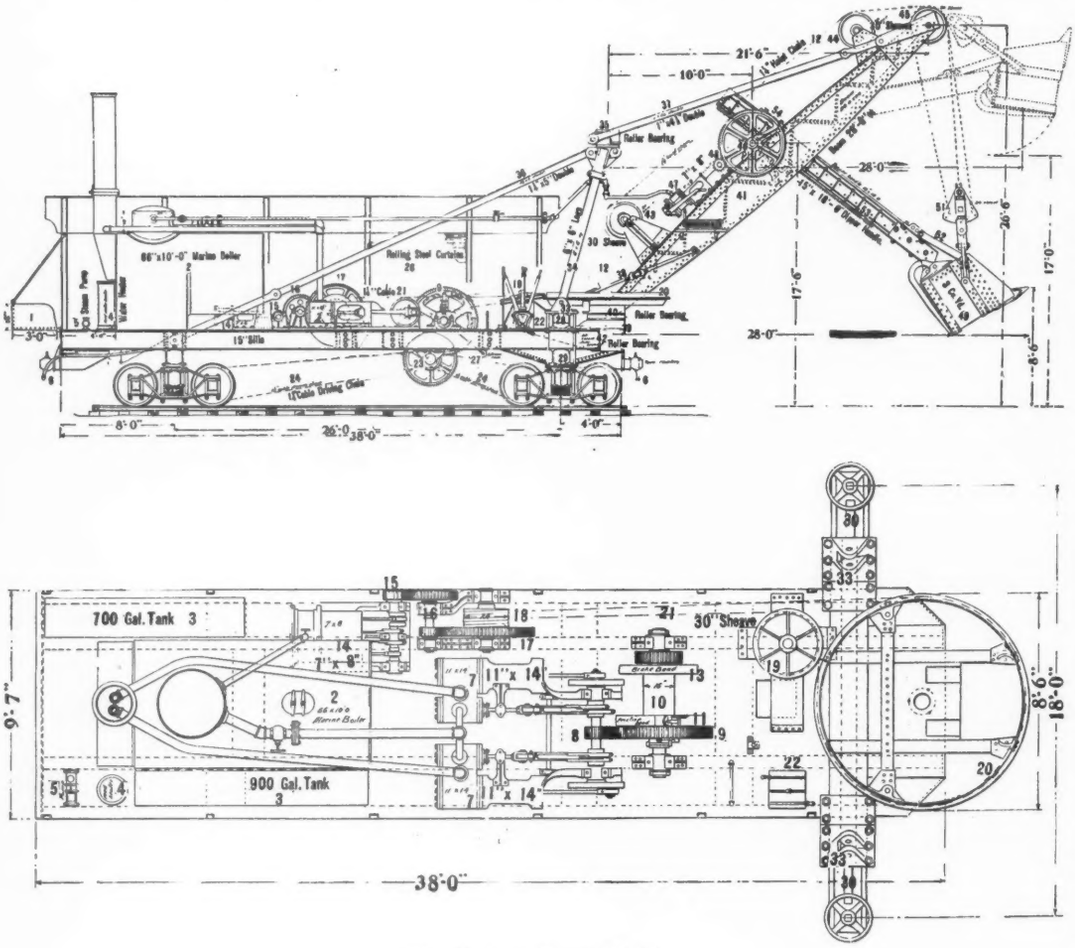
the latter company repaired the defective part before starting it for St. Louis, Mo.

The decision was by District Judge Humphrey. The judge said that if a company was to be let off on proof of due diligence it would be impossible for the Government to prosecute in any case. The defendant cited no authority in support of the doctrine of due diligence as a defence to a penal action. The court decides this point on the principle that has been invoked to punish dealers in adulterated foods, where the penalty applies even though the seller of forbidden articles has no knowledge of their defective quality. The force of inspectors and repairmen was largely increased at East St. Louis after the suit was begun; and, on considering this and other circumstances, the judge holds that the former inspection was "almost a farce."

New Heavy-Duty Vulcan Shovel.

The latest design of heavy-duty steam shovel of the Vulcan Iron Works Company, Toledo, Ohio, is shown herewith. It is a 70-ton shovel and is known as "Giant C." It has been provided with larger cast-steel trunnion at the foot, and is supported at the point by wrought-iron stirrups. These stirrups are connected to the A-frame head with heavy double flat eye-bars, with links and heavy pins.

The dipper handle is of heavy steel I-beams, stiffened with channels and bars. The racking is wrought iron with cut teeth. Each side is one continuous piece, bolted to the flanges of the stiffener channels to avoid loosening of bolts and rivets, and overcome lost motion in the teeth. The dipper handle is connected to the dipper with heavy wrought-iron arms, fitted into the dipper back. Three styles of dippers are provided: round, square or semi-square, according to the class of material to be dug. Heavy plates are used in the shell and all rivets are driven in fair holes with close pitch. For convenience in finishing slopes, etc., the dipper is adjustable to any pitch. The mouthpiece and wearing plates are manganese steel. The teeth are hammered iron with tool steel or manganese adjustable points. No steel castings are used in these dippers, hammered wrought steel and wrought-iron having proven superior in durability, and are better adapted generally. The dipper



The Vulcan Steam Shovel.

This same construction is also followed in the swinging engines. The hoisting engines are reversible with links. All parts are interchangeable. The hoisting friction is of new design and simple construction, with few parts. These frictions may be operated by hand or steam at the will of the operator, both means being provided. All steam cylinders are lubricated with a power pump which does the work thoroughly and economically.

The circle is made somewhat heavier than has heretofore been the practice, and of greater diameter, and swings on roller bearings located between the circle trunnion and base castings. Roller bearings are also placed in the A-frame head. These bearings contribute largely to the ease and rapidity of operation of the shovel. The A-frame has heavy wrought-iron legs set into steel castings on the top bolster of the car. The bolster is of heavy I-beam girder plates. The front end of the car overhanging the truck bolster is supported with heavy box-section trusses, avoiding the possibility of breaking the base casting. The front corners of the car are beveled to prevent the dipper from striking the car when working on either quarter. The jack arms are of heavy wrought-iron construction, of either rigid or swinging design. Both sizes are tied together with a wrought-iron yoke. The car is made up of six heavy beams, four of which run the full length. Heavy steel spreaders or separators are used in the car body, with heavy tie rods crosswise, making a rigid foundation upon which to build the operating machinery. The deck of the car is covered with steel plates well riveted, making a permanent flooring. The car entire is longer than other Vulcan designs, allowing more room for working, and also avoiding the need of hanging a box to the rear of the platform for coal. The boilers are of the marine return-tubular type, tested to carry 150 lbs. working pressure. All boilers are equipped with both pump and injector feed, the pump feeding through a hot water heater.

In the steam piping, fittings have been dispensed with wherever possible, and bent piping used in their stead. All steam pipes, boiler and machinery, excepting on the boom, are under cover. The house is of structural steel with a steel roof, and rolling steel curtains at the sides and rear. The rear guys are double, of flat eye-bar construction, adjustable to lower the boom to the height of standard clearance. The car is mounted on heavy diamond arch-bar trucks with M. C. B. wheels and axles. These shovels are self-propelling under ordinary conditions, the gear having a power ratio of 4 to 1, driving from both trucks.

The company has in contemplation for the near future the construction of a revolving

sheaves than heretofore used, which are bushed with bronze metal and mounted on shafts of hammered steel of increased diameter. A mechanical device for lubricating all loose running sheaves is provided. The boom is of box-section and is made up of steel angles and plates. It is thoroughly braced internally to withstand the intermittent strains, particularly the "side-whip" to which steam shovels are subjected. This boom, it is claimed, is 15 per cent. lighter in weight and is 20 per cent. stronger than any other design. The boom rests in a steel handle operates over wrought-steel shipper shaft pinions with cut teeth. The shipper shaft is made with square seats for gear and pinion, and rests in heavy adjustable bearings. All boom gearings are also of steel with cut teeth.

The crowding engines are a new pattern. They are equipped with balanced, steam-packed main and throttle valves. The engine pinion is steel, with cut teeth. The crank shafts of the engines are hammered wrought steel, and in addition to standard bearings are mounted on center bearings.

shovel which will be particularly adapted for small brick plants, stock-pile work, cellar digging and other classes of work where shovels of the standard types are impractical.

Sheffield Motor Cars.

The Sheffield inspection motor car No. 15 is shown in Fig. 1 of the accompanying illustrations, and is known as the automobile type. It has been on the market for about a year, has been thoroughly tested in service and demonstrated its advantages. It has a seating capacity for four persons, and is driven by a 6-h.p. single-cylinder vertical gasoline engine. It has a maximum speed of 30 m.p.h. The speed is entirely under the control of the operator and may readily be reduced to 3 or 4 m.p.h. The engine has electric ignition with non-breakable spark plugs. These plugs are so designed and placed as to be readily accessible and easily and quickly cleaned. The planetary type of power transmission is used, providing two forward and one reverse speed. The gears run in oil.

Lubrication is by a forced-feed system, driven from the crank compression. It is therefore automatic, operating only when the car is running and requiring no attention other than filling the oil tank once a week. The carburetter is the same as used on all types of Sheffield cars, which is of proven merit and claimed to be one of the most satisfactory in use. The equipment includes a small bronze centrifugal pump for circulating the cooling water. One advantage of the car is the accessibility of the machinery. By removal of the panels under the front seat the machinery is exposed. But if necessary the seat can be easily removed by loosening four carriage bolts holding it to the frame, and the machinery completely uncovered.

The frame is of the lightest possible construction consistent with service requirements, steel and wood being used. The wheels are 22 in. in diameter with wood centers. The axles are 1⅛-in. nickel steel placed inside 2-in. steel tubing, and have roller bearings. The car, in working order, weighs 980 lbs. The canopy top is not included in the regular equipment, being supplied extra when desired. The brake is the regular band type, operated by a foot lever. In a test for emergency stop the car was brought to a standstill from 30 m.p.h. in about 62 ft., reversal and the brake both being used.

A new car, just brought out, is No. 14 of Fig. 2, also an automobile type. It is called a section motor car, being intended primarily for section gangs in place of hand-cars. It would also be useful for bridge gangs and in transporting crews in large switching yards, saving the switch engines. Its normal capacity is four persons besides the operator, with space for tools and supplies. The maximum speed ahead is 15 m.p.h., and 5 m.p.h. reversed. Its weight in working order is 1,015 lbs. These cars are made and sold by Fairbanks, Morse & Co., Chicago.

Fig. 1—Sheffield Inspection Motor Car No. 15.

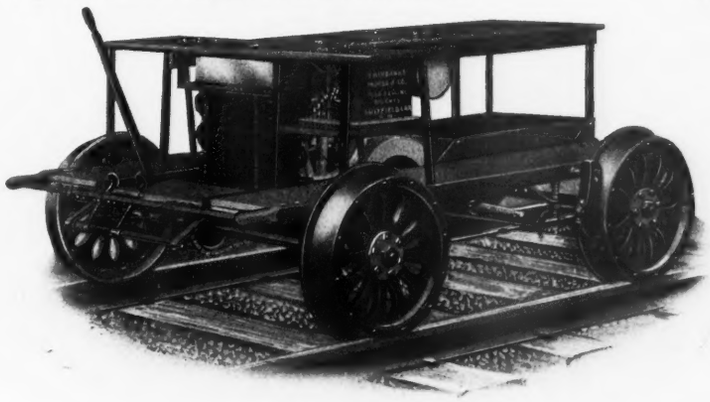
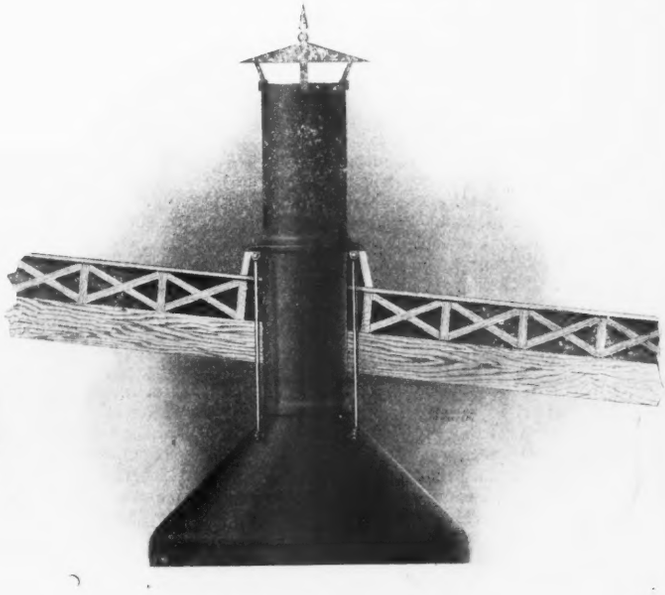


Fig. 2—Sheffield Section Motor Car No. 14.

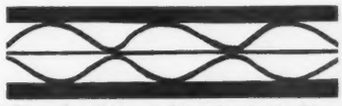
A New Material for Smoke Jacks.

The question of a suitable material for roundhouse smoke jacks has engaged the attention of railroad officers for a long time. Wooden jacks fire-proofed with paint and sand have been much used because they do not corrode. But they are objectionable for a good many reasons, one being their liability to catch fire. Another is that only the simpler, cruder forms of jacks can be made of wood. Cast-iron has been extensively employed and is probably the most satisfactory material that has been used up to the present. A jack made of cast-iron of the proper mixture no doubt answers the purpose very well, but a serious objection is the weight.

A new material has lately been put on the market which, it is claimed, embodies all of the desired features for smoke-jacks. It is known as "vitribestos" and is made by a patented process. A full-sized section of a standard-ply sheet of this material is shown herewith from which it is seen to consist of two outer layers with a thin corrugated sheet between, providing air spaces. The effectiveness of the air insulation was demonstrated in a test made by Robt. W. Hunt & Co. for the City of Chicago for the purpose of learning if this material would make an effective lining for the steel curtains required by ordinance for all of the theaters. A temperature of 1,500 deg. F. on one side of the sheet raised the opposite side to 430 deg.



Design of Smoke-Jack Made from Vitribestos.



Full Size Section of Standard-ply Sheet of Vitribestos.

An increase of 500 deg. in the furnace side of the sheet caused no further rise on the other side. The material was accordingly specified for, and subsequently applied to, the steel curtains mentioned.

Briefly, the claims made for it are, that it does not sweat, will not corrode or burn, is not affected by the weather, is easily handled and can be made into any form or desired size. It is no more expensive than cast-iron, while weighing only about 7 or 8 per cent. as much as the latter. The standard ply is approximately 5/8 in., but the sheets may be made any thickness and with any number of layers desired. The material can be made into jacks in combination with cast-iron, thereby reducing the weight to any desired extent within the minimum.

In the construction of the jack the vitribestos can be made into sections of any size and length desired. These sections are fastened together by means of brass bolts passing through flanges reinforced by imbedding metal flanges within the material. The bolts are covered with asbestos cement to protect them from the gases. A view is shown of a three-section jack with an elliptical hood, made from vitribestos. The Pennsylvania now has a large order placed for smoke-jacks made of this material and will use them at different roundhouses on the system. The vitribestos jack is made by Paul Dickinson, Chicago. One desirable and satisfactory jack in which he uses this material is a combination telescoping jack, the lower part, where strength is required, being made of iron, and the upper part of vitribestos.

Report on Affairs of the Panama Railroad Company.

The report of the sub-committee of the Committee on Interstate and Foreign Commerce, appointed to investigate the affairs of the Panama Railroad Company, has been made public. A resolution was approved Jan. 12, 1905, authorizing the investigation, and on January 13 a sub-committee consisting of Mr. Shackleford, Mr. Lovering, Mr. Esch, Mr. Townsend and Mr. Adamson was appointed. The committee regrets that owing to the shortness of the session and the great press of business before the Committee on Interstate and Foreign Commerce, it has not been able to take all the testimony that it would otherwise have taken. It was especially desired to investigate the relationship, if any, existing between the Pacific Mail Steamship Company and the trans-continental railroads. The committee reports that the testimony shows that the management by the officers and directors of the Panama Railroad has been conspicuously able, progressive and business-like. When the United States became the owner of a majority of the stock of the railroad company seven of the directors resigned and the seven canal commissioners were elected in their places. This was done in pursuance of a letter from the President to Secretary Taft. The committee calls attention to the value of the railroad property, as disclosed by the evidence. The railroad has shown its capacity to earn substantial dividends for many years. Undoubtedly the traffic over the line could be greatly increased by improving the ship service connected with it. There ought to be a prompt and direct-connecting line of steamers running on regular schedules between Colon and New York, between Colon and some Gulf port and between Panama and San Francisco. By such arrangement the time between San Francisco and Gulf ports could be reduced to 15 days and between San Francisco and New York to 17 days.

The report insists that the United States shall own and operate the Panama Railroad; also, that the railroad must not be closed, nor must its earning capacity nor its efficiency as an artery of commerce be impaired. For more than 50 years the Panama Railroad has been used as an international highway. The report also says that the Panama Railroad and connected ship lines have had a marked effect in reducing the rates of the trans-continental railroads, and that further reductions could be secured by reducing the charges by the Isthmian route, which could be done materially and still keep within the limit of fair remunerative rates.

In summing up, the committee is of the opinion that the Government should operate the Panama Railroad as a public highway, and in connection therewith should operate lines of ships, as previously mentioned, charging only a "fair and remunerative" rate. In carrying out the policy it is suggested that some of the Government transports could be used to supplement the steamers now owned by the Panama Railroad Company. The committee believes that for the present it is best to continue the general offices of the railroad at New York, and that this can be done at a great reduction of the present expense.

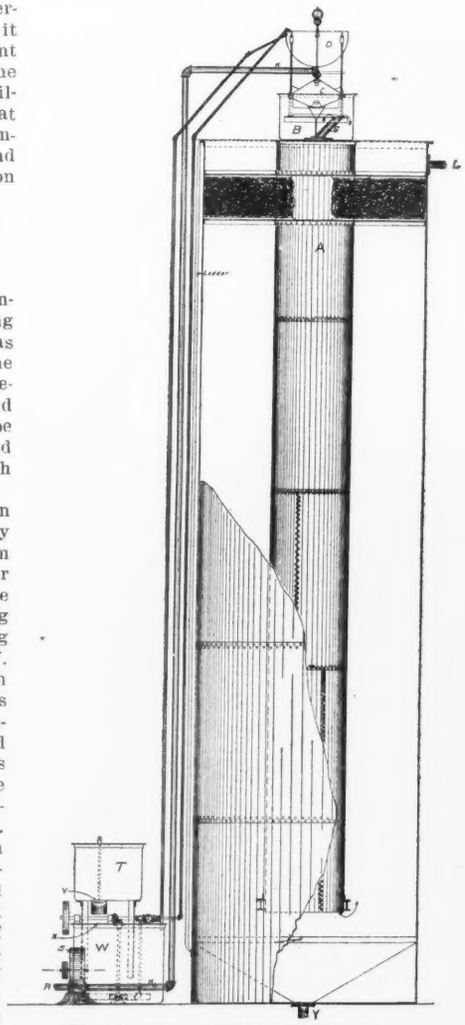
The American Water Softener.

One of the greatest drawbacks to the installation of plants for chemically treating locomotive feed water—a drawback that has remained from the very conception of the Porter-Clark process down to the most recent years—has been the complicated and cumbersome machinery that appeared to be necessary for accurately, automatically and continuously mixing those chemicals with the water.

The accompanying illustration shows an elevation of the complete machine made by the American Water Softener Company, from which it will be noted that the crude water is brought from the pump main through the pipe R to the water motor S, thus causing the motor to operate the pump and stirring device on chemical solution tanks T and W. Leaving the motor the water rises through pipe K and flows into one of the chambers of the oscillating receiver C. When this chamber is filled, the center of gravity is moved and the receiver tips, pouring its contents into the mixing tank B below, at the same time bringing the other chamber of the receiver beneath the orifice of the pipe K. Above the oscillating receiver is placed a semicircular tank D, containing the chemicals, and in the bottom of this tank is fitted a valve through which the chemicals fall into the oscillating receiver. A system of levers connected to the receiver operates the valve at the bottom of tank D. The lift of the valve can be regulated so that a given quantity of chemicals can be mixed with the water. In order to keep the lime milk in constant motion, an agitator is fixed inside the tank D, which is driven through a rod connected to one side of C. On the under side of C is fixed a plate which thoroughly mixes the chemicals and crude water.

From the tank B the water passes through the pipe G into the cylindrical downtake A. In passing through the pipe G the water is given a circular motion in the downtake A by means of the angle at which the pipe is set to the same. This circular motion has the further effect of keeping the water thoroughly stirred, thus aiding the chemical reaction. The precipitation in this downtake is in the same direction as the flow of the water. The advantage of this is that the settlement is then in the same direction as the flow of the water. Reaching the bottom of the downtake the water reverses its flow. Here the flow of the water is greatly slackened owing to the largely increased area through which the water now passes. Practically all the precipitated matters that have not already left the water, easily settle to the bottom of the tank. After the water reaches the top of the settling tank it passes through the excelsior filter and flows thence to the storage tanks through the pipe L.

The chemical solution is prepared thus: In the upper tank marked T situated at the base of the settling tank a certain amount of fresh lime is slacked with water. After the lime is completely slaked the soda-ash is added in the requisite amount. Raising the valve V the solution passes through the screen X into the lower tank W. This screen removes all fine particles of sand and dirt.



The American Water Softener.

The solution in sufficient quantity for 24 hours' run of the plant is kept thoroughly agitated by means of a paddle, as shown, and is pumped from this tank to the tank D on top of the machine. Any excess from this tank D flows back to the tank W through the pipes as shown.

From this description it can readily be seen that no outside power is necessary, as the flowing water turns the water motor and this in turn agitates and pumps the chemicals. The building enclosing the parts at base of machine also contains air-tight bins for the storage of chemicals. An enclosed stairway connects the base and top of plant, thus providing protection to the attendant from the dangers of iron ladders exposed to all kinds of weather.

ENGINEERING SOCIETY LIBRARY, UNIVERSITY OF MICHIGAN

CONSTRUCTION NUMBER

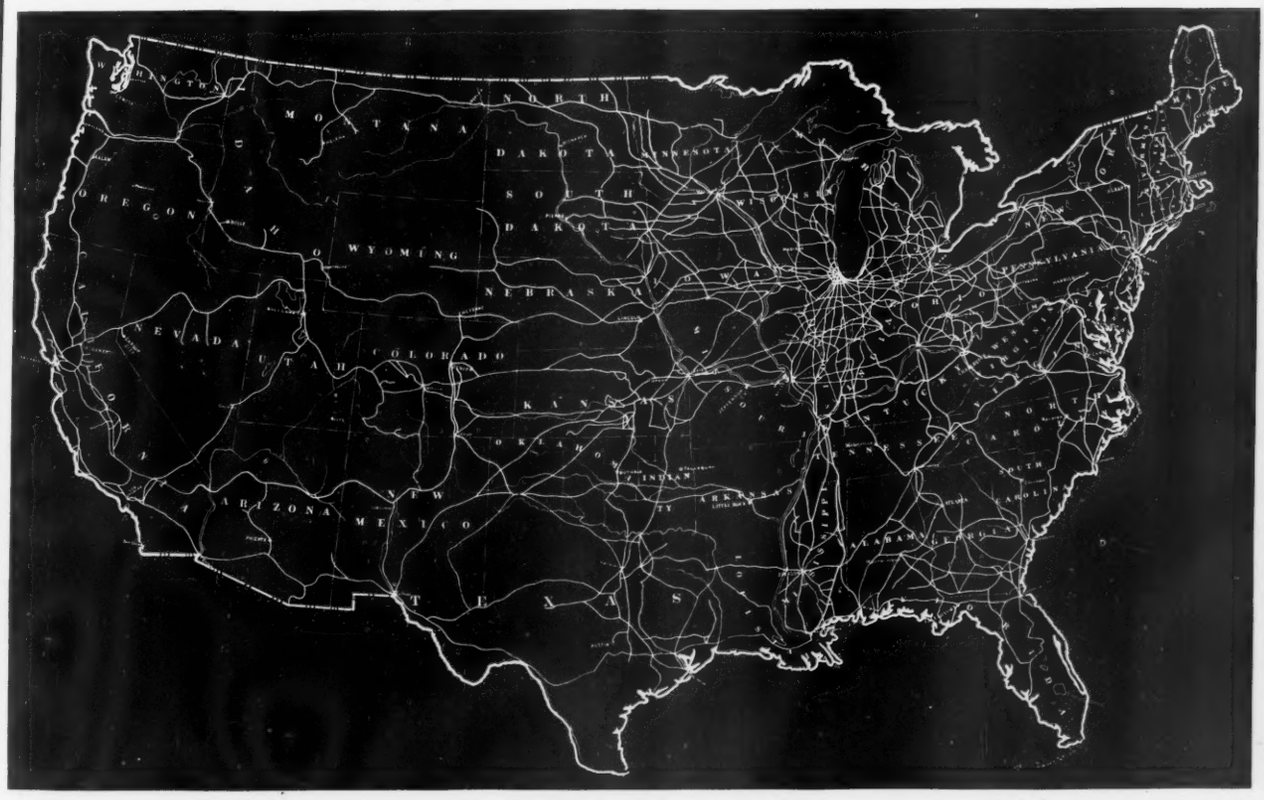
RAILROAD GAZETTE

QUARTO VOL. XXXVIII.—No. 11. 134 PAGES—TWO PARTS. PART TWO

CHICAGO NEW YORK, FRIDAY, MARCH 17th, 1905 LONDON

A graphic illustration of railroads in the United States which have used our

Wolhaupter, Q. & W. and Servis Tie Plates



THE RAILROAD SUPPLY CO.

CHICAGO NEW YORK

THE BUCKEYE LIGHT

MADE IN SIZES FROM
1000 TO 5000 CANDLE POWER
IS RECOGNIZED AS THE STANDARD FOR
CONTRACTORS WORK
RAILROADS
FOR TRACKLAYING, WRECKS AND REPAIR WORK
STEEL & IRON WORKS
FOUNDRIES.
BRIDGE BUILDING Etc.

ASK FOR CATALOGUE.

NIGHT TURNED INTO DAY.

SEND FOR CATALOG TO
WALTER MACLEOD & CO.,
CINCINNATI, OHIO, U. S. A.

ESTABLISHED IN APRIL, 1856.
PUBLISHED EVERY FRIDAY
AT 83 FULTON STREET, NEW YORK, AND AT QUEEN ANNE'S CHAMBERS, LONDON, S. W.
$4.20 per Year to U. S. and Canada.
$6.08 per Year to Foreign Countries.

CONTENTS OF PART TWO.

Railroads Building and Proposed:
United States 87
Canada 130
Mexico 134
Bridge Work Proposed:
United States 138
Canada 152
Mexico 154
Index to Advertisements 88

Part Two of the *Railroad Gazette* is intended to include:

Every new line, extension or important improvement proposed or building in the United States, Canada and Mexico.

Correct corporate names of companies.

Names and addresses of officers of the newer companies, including Chief Engineer.

Complete list of companies incorporated within the past few months, with names and addresses of incorporators.

Alphabetical arrangement of companies, with cross references to subordinate lines, by which projects of one company under a different corporate name may be located without difficulty.

Separation by paragraphs of different projects of the same company.

Route, length, terminals and important railroad connections of projected lines.

Indication by an asterisk (*) of projects for which contracts have been let.

Present state of surveys, financial aid, right of way, grading, track laying, etc.

Names and addresses of contractors, both general and special, so far as obtainable.

The date (March 11, 1904) following an item indicates that nothing has been heard either officially or through press reports since the last issue of this construction record. Should nothing more be heard for another six months these items will be dropped from the list.

Complete list of important bridges in the United States, Canada and Mexico for which contracts are yet to be let.

NEW RAILROAD AND BRIDGE WORK.

In the accompanying pages will be found the 11th regular construction record of the *Railroad Gazette*, which was compiled semi-annually from the spring of 1898 until March, 1902, when it was made an annual report. This construction record contains a list of railroads proposed, incorporated or building in the United States, Canada and Mexico. There are 1,480 definite projects reported, representing 1,273 companies in different stages of advancement. Of this number, 1,230 are the projects of 1,080 companies in the United States, 135 represent 95 companies in Canada and 114 represent 98 companies in Mexico. The following table gives a comparison of the number of projects and companies in the United States, as recorded in the last six construction records.

	United States. Projects.	United States. Companies.
February, 1900	1,350	1,030
July, 1900	1,500	1,090
March, 1901	1,700	1,290
October, 1901	1,689	1,038
March, 1902	1,308	995
March, 1903	1,797	1,490
March, 1904	1,600	1,336
March, 1905	1,230	1,080

The asterisk (*) is used to denote that contracts have been let, or that work has actually been begun on new railroads, extensions and improvements. It is our policy to be as conservative as possible in marking projects, and in the very large majority of cases where the asterisk appears, definite news has been received that work has actually been begun, or that contracts have been let. In many cases where work is not yet under way, the information given has been received direct from officers or incorporators. The number of lines, extensions, or improvements actually building in Canada and Mexico at the present time is presumably greater than the estimate given, owing to the difficulty experienced in getting information from remote distances. The projects marked with the date (March 11, 1904) indicate that nothing has been heard either officially or through press reports, since the last construction record was issued. These items are retained without change, as they were reported in our previous construction record. All of the lines completed during the past year have been omitted entirely, notice of their completion having been given in the regular weekly issues of the *Railroad Gazette*.

The total number of projects under contract or building is considerably smaller than it was last year. This appears to be due (1) to the policy of the larger railroads in cutting down operating expenses by postponing a large amount of construction work which was planned during the rush of traffic in 1902 and 1903, and (2) to the number of small companies which, after incorporation, have either never begun actual construction work or after beginning work have found themselves unable to finance their projects and have been forced to suspend operations. On the other hand, although the number of projects is comparatively smaller than last year, this is largely compensated for by the important character of much of the work now under way.

The following is a comparative estimate of the number of projects on which work has been reported in progress in our construction record, from Feb., 1899, through the present issue:

	United States.	Canada.	Mexico.	Total.
February, 1899 ...	255	22	13	290
March, 1900	295	33	19	347
July, 1900	407	36	22	465
March, 1901	352	35	21	408
October, 1901	352	37	15	404
March, 1902	399	42	12	453
March, 1903	569	38	19	626
March, 1904	465	38	23	526
March, 1905	253	35	17	305

In addition to the railroad projects already noted, we also give a very full list of bridges which are under consideration, for which contracts are, so far as we can learn, yet to be let. This list is intended to include the larger steel and stone structures, whether for railroads or not, and we have aimed to record only those which seem likely to be built. Bridges which are needed on new railroads, mentioned under railroads (building and proposed), are only included in this list where specific information was obtainable. As a rule, they are not mentioned. There are approximately 800 entries, under about 475 cities and towns of the United States and Canada. This list includes about 1,100 new projects. Proposed bridge work of which nothing has been heard since our last record has been omitted from this issue. It is interesting to note that there are on the North American continent more than 85 bridges proposed, the cost of which will reach over $100,000 each, every one of which appears to have a good prospect of being built. There are about 19 structures, the cost of which will reach more than $1,000,000 each. But the majority of the bridges included in the record are structures costing from $20,000 to perhaps $60,000 each.

In cases where bids are wanted on any work, we have endeavored to get the date on which bids will be received; also the name and address of the person who will receive the bids, or the engineer in charge who may possibly be able to give information. Up to June 1, dates are already set for the awarding of 67 different bridge contracts.

RAILROADS BUILDING AND PROPOSED.

United States.

ACME, RED RIVER & NORTHERN.—Proposed line from Acme, Tex., on the Fort Worth & Denver City north to the Red River, 8 miles. E. H. East and T. La Hache, of Sherman, Tex., are interested. (Mar. 11, 1904.)

*ADAIR COUNTY.—Work in progress on this road in Adair County, Mo., five miles. Cameron, McManus & Joyce, Keokuk, Iowa, contractors. E. M. Collins, Kansas City, Mo., Chief Engineer.

ADRIAN & JACKSON TRACTION.—Incorporated in Michigan to build an electric railroad from Adrian to Jackson, with a branch to Cement City, about 40 miles. J. E. Bugbee, Adrian, Mich., is an incorporator.

ALABAMA ROADS.—The Lewin Lumber Co. will build a logging road from its mills near Attalla, Ala., south to Etowahton, 15 miles. (Mar. 11, 1904.)

——Projected line of the Cedar Creek Mill Company, Brewton, Ala., from Brewton north to timber lands in Escambia and Conecuh Counties. T. R. Miller is President. (Mar. 11, 1904.)

*ALASKA CENTRAL.—This road has completed 18 miles of track, and 30 miles have been graded from Seward in a northerly direction. The proposed route is from Seward, on Resurrection Bay, Alaska, north to Lake Kenai, and thence through Cariboo and Tanana passes to Fairbanks, 463 miles, with a 30-mile branch to the Metamuska coal fields. Grading to be begun on this branch in May. The whole line is under contract to the Tanana Railway Construction Company. A. C. Frost, of Chicago, is President, and A. B. Poland, General Manager and Chief Engineer.

ALASKA MIDLAND—Incorporated in the State of Washington, with a capital of $5,000,000. Robert Moran, Jacob Furth and R. A. Ballinger are incorporators.

ALASKA RAILROAD.—Incorporated to build from Valdez, on Prince William Sound, Alaska, to Eagle City, on the Yukon River, 425 miles, with a branch from the headwaters of the Tanana River northwest across the Yukon River to Behring Straits. W. B. Bradley and Geo. T. Foster, 15 Exchange Place, Jersey City, are incorporators. (Mar. 11, 1904.)

ALBANY & CATSKILL (Electric).—Incorporated in New York to build an electric line from Catskill to Albany, 35 miles. J. M. Sheehan and I. F. Gillespie, Newburgh, N. Y., are directors. (Mar. 11, 1904.)

ALBION & LOCKPORT (Electric).—Incorporated in New York to build between Albion and Lockport, 25 miles. George B. Church, Albion, N. Y., is interested.

ALBION & ROCHESTER (Electric).—Incorporated in New York to build an electric line from Albion to Rochester, 28 miles. A. K. Potter, Lockport, N. Y., is interested.

*ALBUQUERQUE EASTERN (SANTA FE CENTRAL).—Work reported begun in this new line from Moriarty, N. Mex., on the Santa Fe Central, to Albuquerque, 46 miles. W. H. Andrews, of Albuquerque, N. Mex., is interested.

ALEXANDRIA, BAYOU MACON & GREENVILLE. Chartered in Louisiana to build from Alexandria, La., to Greenville, Miss., 150 miles. The headquarters will be at Delhi, La. J. D. Garrison is Chief Engineer.

ALLEGHENY & WESTMORELAND.—Chartered to build from a point near Port Perry, Pa., to a point near Mt. Pleasant, 28 miles. W. B. Linn is President; T. B. Franklin, E. S. King, C. C. Bent and Geo. H. Stein, of Philadelphia, are directors. (Mar. 11, 1904.)

*ALLEGHENY RAILROAD.—New line from Davis, W. Va., via Beacon, to Stony River, in Grant County, 15 miles. Contract let for first section from Davis to Beacon, five miles. Work to begin this month. A. R. Stalling, Davis, W. Va., is President.

ALLINGTON SHORT LINE.—Chartered to build from Allington, Nicholas County, W. Va., to Delphi, in the same county. J. C. Roane, of Weston, W. Va., is an incorporator.

ALPENA, GAYLORD & WESTERN.—Maps filed by this company showing the location of its proposed route from Alpena, Mich., on Lake Huron, through Otsego, Antrim, Kalkaska and Grand Traverse Counties to Gaylord, 65 miles. C. M. Stevens, 602 Majestic Building, Detroit, is said to be interested.

ALTON, JACKSONVILLE & PEORIA.—Incorporated in Illinois to build a railroad from Alton to Peoria, with branch lines to Grafton and Jerseyville. Robert Curdie, Alton, Ill., and J. W. Booker, Jerseyville, Ill., are incorporators.

AMADOR RAILROAD.—Incorporated in Delaware to build from a point on the Cœur d'Alene branch of the Northern Pacific in Montana to the Amador mine. Erasmus B. Waples, of Wilmington, Del., and William Surlin, of Carlinville, Ill., are interested.

AMARILLO, CANYON CITY & LUBBOCK.—This company is to be organized in Texas, with headquarters at Canyon City, to build from Canyon City south to Lubbock, about 100 miles. The territory to be traversed is entirely without railroad facilities.

*AMERICAN-MEXICAN PACIFIC.—Incorporated with headquarters at Tucson, Ariz., to build 2,000 miles of railroad. The first building will be from Phoenix, Ariz., southeast to Tucson, Calabasas and Naco, with a branch from Tucson to Dudleyville, at the junction of the Gila and San Pedro rivers, and a branch from Naco to San Jorge Bay, on the Gulf of Cola; 250 miles of which is under contract to William C. Brad-

ALPHABETICAL INDEX TO ADVERTISERS.

Adreon & Co. 137
Alabama Frog & Switch Co. 97
American Blower Co. 128
American Bureau of Inspection & Tests 125
American Concrete Construction Co. 113
American Hoist & Derrick Co. 141
American Railway Signal Co. 131
American School of Correspondence 115
Archer Iron Works 147
Atlantic Equipment Co. 135
Baldwin Locomotive Works 143
Baltimore Bridge Co. 139
Baxter & Co., G. S. 123
Beaver Dam Malleable Iron Co. 127
Blackmer & Post Pipe Co. 107
Block Pollak Iron Co. 125
Border Bolt & Nut Lock Co. 133
Buda Fdy. & Mfg. Co. 117
Chicago Bridge & Iron Works 155
Cleveland Frog & Crossing Co. 97
Climax Stock Guard Co. 112
Continuous Rail Joint Co. 91
Contractors' Plant Mfg. Co. 133
Contractors' Supply & Equipment Co. 129
Conard, Thos. P. 127
Cook Well Co 125
Cowing, John P. 111
Dickinson, Paul 119
Dixon Crucible Co., Jos. 120, 121
Duff Mfg. Co. 117
Evens & Howard Fire Brick Co. 105
Fairbanks, Morse & Co. 99
Federal Railway Signal Co. 129
Fenn Contracting Co. 135
Fitz Hugh, Luther, Co. 122
Friestedt Interlocking C. B. Co. 109
General Pneumatic Tool Co. 113
Harris, E. T. 147
Illinois Steel Co. 101
Independent R. R. Supply Co. 131
Indianapolis Switch & Frog Co. 97
Ingersoll-Sergeant Drill Co. 114
Johnson Wrecking Frog Co. 135
Kilbourne & Jacobs Mfg. Co. 145
King Bridge Co. 139
Lambert Hoisting Eng. Co. 141
Light Inspection Car Co. 145
Macleod & Co., Walter 86
McArthur Bros. Co. 137
Merchant & Co. 129
Mitchell-Crittenden Tie Co. 144
Municipal Eng. & Con. Co. 120
National Sky Light System 93
National Ventilating Co. 93
Nitro Powder Co. 127
Otto Gas Engine Works 151
Railroad Supply Co. 85
Railway Appliances Co. 89
Raymond Concrete Piling Co. 103
Rodger Ballast Car Co. 149
Ruehle & Co., E. G. 152
Safety Nut Lock Co. 123
Scherzer Rolling Lift Bridge Co. 153
Society for Protection of Italian Immigrants. 116
Southern Iron & Equipment Co. 132
Standard Tool Co. 130
St. Louis Expanded Metal F. Co. 111
Szerelmey & Co. 128
U. S. Steel Piling Co. 108
Vulcan Iron Works 143
Watson, Benj. 125
Watson, J. B. 123
Weber Ry. Joint Mfg. Co. 95
Wells Light Mfg. Co. 156
Western Wheeled Scraper Co. 91

bury & Co., of Denver, Colo. Grading has already been begun. Lyman Bridges is President and Chief Engineer; S. W. Purcell, General Attorney; D. M. M. Shorb, Purchasing Agent, and P. B. Ziegler, Master Mechanic.

ANDERSON & SALINE RIVER.—Incorporated in Arkansas to build from Clio, Cleveland County, to a point in Grant County. G. W. Ritchie is interested.

ANDERSON, ELWOOD & LAPEL.—New line from Elwood, Ind., to Brazil, 85 miles. Projected. Thomas Newkirk, Elwood, Ind., is interested. (Mar. 11, 1904.)

*ARIZONA & CALIFORNIA (A., T. & S. F.).—New line from Arizona and California Junction near Wickenburg, north of Phoenix, on the Santa Fe, Prescott & Phoenix, west to the Colorado River and into Southern California. Five miles of track is laid and grading is in progress from mile post 5 to mile post 48, most of which is reported to be finished. The Grant Bros. Construction Co., of Los Angeles, Cal., has the contract for grading.

——Extension from mile post 48 to Parker, 62 miles. Under survey.

ARIZONA & COLORADO.—Incorporated in Colorado to build a railroad from Tucson, Ariz., to Durango, Colo., with branch line from Durango to Silverton and Dolores. Surveys reported in progress. E. M. McFarland, of Tucson, Ariz., is an incorporator.

ARIZONA EASTERN.—Incorporated in Arizona to build a railroad from Yuma east to Clifton, 350 miles. E. S. Ives, Yuma, Ariz., and R. R. Coleman, Prescott, Ariz., are incorporators.

ARIZONA ROADS.—The Transvaal Mining Company will build a narrow gage railroad 16 miles long, from its mines in southern Arizona, to a connection with the Nacozari R. R., at Douglas. (Mar. 11, 1904.)

——Proposed line from Tucson, Ariz., to Nogales, 65 miles. The American Pacific Co. is interested. (Mar. 11, 1904.)

ARKANSAS ANTHRACITE RAILROAD.—Incorporated in Arkansas to build from Fort Smith, Ark., through Sebastian, Crawford, Franklin and Johnson Counties to Clarksville, 66 miles. E. E. Miller and J. F. Reid, of Fort Smith, Ark., are incorporators.

ARKANSAS CENTRAL.—Proposed extension from Paris, Ark., to Russellville, and eventually to Bald Knob, 133 miles. No work as yet. (Mar. 11, 1904.)

ARKANSAS COAL & MINERAL.—Proposed line from Hartford, Ark., north to Harrison, 125 miles. J. W. Goldsby, Waldron, Ark., and E. T. McConnell, of Huntington, Ark., are interested. (Mar. 11, 1904.)

*ARKANSAS, MISSOURI & KANSAS.—This company is to build from Chanute, Kan., through Joplin, Mo., to Memphis, Tenn., through the counties of Neosho, Crawford and Cherokee in Kansas, the counties of Jasper, Newton, Barry and Stone in Missouri, and thence southeast through Arkansas to Memphis. The line between Joplin, Mo., and Chanute, Kan., will be built first. Grading is reported completed on 25 miles in Cherokee County. The contract for building has been let to Joseph Ceruss, Decatur, Ill. Rights of way have all been secured. W. D. Spooner, Joplin, Mo., is Chief Engineer.

ARKANSAS RIVER & SOUTHERN.—Chartered in Arkansas to build from Redemption, in Perry County, to Maumelle, in Pulaski County, on the Choctaw, Oklahoma & Gulf, 20 miles. G. W. Perry, T. C. Bragg and B. Thurston are incorporators.

ARKANSAS ROADS.—A company has been organized in Arkansas to build from West Point through Kensett to Searcy, in White County, 9 miles. H. G. Smith and W. H. Foster, of West Point, Ark., are interested.

*ARKANSAS SOUTHERN.—Contract let to Epple & Hays, Shreveport, La., for grading the first nine miles of the proposed extension of this road from Winnfield, La., to Alexandria, 45 miles. The character of the work is easy, with a maximum curvature of 3½ deg. and a maximum grade of 0.9 per cent. J. A. Knox, Ruston, La., is Chief Engineer.

ARKANSAS VALLEY & WESTERN (ST. LOUIS & SAN FRANCISCO).—Surveys in progress for an extension from Avard, Okla. T., west through the counties of Woodward and Beaver, to Hooker, in the northwestern portion of Beaver County, about 200 miles. The main line of this road was recently completed from Vinita, Ind. T., to Avard, Okla. T.

ARKANSAS WESTERN.—Incorporated in Arkansas to build from a point in Scott County, near Waldron, southeast through Montgomery and Garland counties to Hot Springs, 65 miles. C. D. Greaves, Hot Springs, Ark., is interested.

ARLINGTON & PACIFIC COAST.—Incorporated to build from Arlington, Ore., to The Dalles, 110 miles, passing through Condon, Fossil and Rock Creek. Surveys made between Condon and Fossil, 20 miles, and between Rock Creek and The Dalles, 50 miles. J. E. Simmons is President; M. M. Shillock, Secretary, and J. P. Finley, Treasurer, all of Portland, Ore.

ASHLAND & WESTERN.—Incorporated in Ohio to build from Ashland southeast to Custaloga, Wayne County, 20 miles. C. P. Hine, Ashland, Ohio, is interested.

ASHEVILLE & RUTHERFORDTON.—Rights of way have been secured from Asheville, N. C., to Rutherfordton, 40 miles, and surveys made. R. H. Howland, Asheville, N. C., is President.

ATCHISON BELT LINE.—A company has been incorporated to build a belt line at Atchison, Kan. The incorporators include: H. E. Farrell, Freight Traffic Manager of the St. Louis Southwestern at St. Louis; William Carlisle and J. W. Allen of Atchison.

*ATCHISON, TOPEKA & SANTA FE.—Grading under way by Robert Kinkaid, of Tulsa, Ind. T., who has the contract for building an extension from Owosso, Ind. T., south to Tulsa, 12 miles. The present southern terminus of the A., T. & S. F. is Owosso. W. B. Story, Jr., Topeka, Kan., is Chief Engineer.

——Work will be begun on four miles of new line on the Silver Creek & Northern branch between Bayard, N. Mex., and Hurley, to give a better alinement and to secure protection against high water.

——About 155 miles of second track will be built, including the completion of the double track between Chicago and Streator, Ill., east and west of Marcelene, Iowa, and the cut-off between Holliday, Kan., and Emporia.

——Work on the cut-off between Texico, N. Mex., on the Pecos Valley line, and the main line west of Albuquerque will probably be begun this spring.

——Reported that rights of way are being secured for a branch line from a point on the main line in the southern part of San Joaquin County, Cal., to Oakdale, where connection will be made with the Sierra Railroad.

——Reported that work will soon begin on a new line from Canyon City, Texas, to Plainview, 100 miles, in consequence of the large increase in immigration to the Southwest.

——Plans reported completed for extensive improvements on the freight terminals at Kansas City. The Santa Fe now has 67 miles of terminal tracks in and about Kansas City, which will be increased to 97 miles. A large gravity yard will be built and a number of storage tracks laid between Argentine and Turner. An elevator with a capacity of 1,500,000 bushels will be built, at an estimated cost of $400,000, at Argentine.

——*Contract let to the Lantry-Sharp Contracting Co., Kansas City, Mo., for changing the location of the line through Truxton Canon, Ariz. The change is made to insure immunity from floods.

——Reported that this company will build a new tunnel under the Raton Mountain, replacing the one which was built when the road was opened into New Mexico.

——See Arizona & California.

——See Jasper & Eastern.

——See San Francisco & Northwestern.

——See Santa Fe, Prescott & Phoenix.

ATHENS & NORTHERN.—Incorporated in Ohio, with headquarters at Columbus, to build from Mineral, in Athens County, through Perry, Morgan and Muskingum counties to Zanesville, 45 miles. C. C. Guthrie, M. T. Reed and M. V. Burnside are incorporators.

ATHENS, AMESVILLE & CHAUNCY.—Incorporated in Ohio, with headquarters at Columbus, to build from Athens, along the Hocking River to the mouth of Sugar Creek, and thence to Amesville, 15 miles, with a branch to Millfield, 10 miles. H. H. McKeehan is interested. (Mar. 11, 1904.)

ATHENS, FLORAL PARK & NEWNAN AIR LINE.—Reported that this company is to be organized in Georgia, to build from Athens southwest through Monroe, Floral Park and Fayetteville to Newnan, 70 miles. Ranson Rogers, 625 Empire building, Atlanta, Ga., is said to be interested.

ATLANTA & GULF.—This company has given notice that it will apply for a charter in Georgia to build a line from Atlanta to the Gulf of Mexico, 400 miles. The proposed route is through Campbell, Douglas and Heard counties in Georgia. The southern terminus has not been decided upon. F. A. Kuhn, Kennon Dearing and R. B. Beedles, of Atlanta, Ga., are interested.

*ATLANTA, KNOXVILLE & NORTHERN (LOUISVILLE & NASHVILLE).—This company is rebuilding 60 miles of its line from Knoxville south to Etowah, Tenn. There will be practically a new roadbed for the entire distance. W. J. Oliver & Co., Knoxville, are the contractors. It is expected to begin track laying about March 1, and to have the line ready for operation by July 1.

——*Grading in progress on an extension from Etowah, Tenn., to Cartersville, Ga., 90 miles, where connection will be made with the Western & Atlantic and the Seaboard Air Line. The contractors for this portion of the line are Wright, Williams & Wadley, of Birmingham, Ala.; track laying will probably be begun in May or June and be finished before the end of 1905.

*ATLANTA NORTHERN (Electric).—New electric line from Atlanta northwest to Marietta, 20 miles. Under construction and nearly finished.

ATLANTIC & BIRMINGHAM.—Extension from Montezuma, Ga., to Birmingham, Ala., 243 miles. Authorized but route not finally decided upon.

——*Extensive improvements reported on line between Offerman, Ga., and Sessoms, which was formerly the Offerman & Western.

——See Brunswick & Birmingham.

ATLANTIC & NORTH CAROLINA.—See Atlantic Railroad.

ATLANTIC & CAROLINA (Electric).—New electric railroad from Atlanta, Ga., to Anderson, S. C., 125 miles. The route as surveyed passes through DeKalb, Gwinette, Jackson, Banks and Franklin counties. M. Mason, Hoschton, Ga., will be in charge of the work.

*ATLANTIC & WESTERN (NORTH CAROLINA).—This road, which is to run from Sanford, N. C., via Jamesboro east to Broadway, 10 miles, is under contract from Jamesboro to Broadway, 6 miles, 2½ miles of which is completed and in operation. An extension from Broadway east to Lillington, 15 miles, has been surveyed. W. J. Edwards, Sanford, N. C., is President and General Manager.

ATLANTIC & WESTERN (WEST VIRGINIA).—Incorporated in West Virginia to build from South Cumberland, Mineral County, W. Va., southwest to the Ohio River, near Huntington. A. C. Dennis, J. B. Hart and J. W. Williams, Clarksburg, W. Va., are incorporators.

ATLANTIC COAST LINE.—Branch from Washington, N. C., south to Newbern, 30 miles. Authorized.

——Extension from Suffolk, Va., southeast to Elizabeth City, N. C., 35 miles. Proposed.

——*Contract let to William T. Cotter, Jacksonville, Fla., for the work in connection with the proposed terminal at Jacksonville. The improvement includes a wharf 2,180 ft. long and large trackage additions to the present terminal yard at this point.

——Extension of the Jacksonville & Southwestern Division from Newberry, Fla., northwest to Perry, 70 miles. Line not yet fully located.

ATLANTIC RAILROAD.—Incorporated in North Carolina to lease the Atlantic & North Carolina and to build an extension of the road from Goldsboro west to Raleigh, 50 miles. J. A. Mills, Raleigh, and G. A. Norwood, Jr., Goldsboro, are incorporators. (Mar. 11, 1904.)

ATLANTIC SHORE LINE (Electric).—This company, whose road runs from Biddeford, Me., to Kennebunkport, and from Sanford, Me., to Cape Porpoise, a total of 36 miles, is considering an extension from Kennebunkport to York, 18 miles. I. L. Meloon, Sanford, Me., is General Manager.

*AUGUSTA & FLORIDA.—Incorporated in Georgia, to build from Augusta to Midville, on the Central of Georgia, 60 miles. Grading in progress.

*AURORA, DE KALB & ROCKFORD (Electric). Contract let to W. C. Ross, of Aurora, Ill., for building this proposed electric railroad from Aurora north through Maple Park and Cortland to De Kalb, 30 miles. The maximum grade will be 2 per cent. and the entire road will be laid with 70-lb. rails. The line will eventually be extended from Aurora north to Rockford, 60 miles. Theodore Worcester, Aurora, Ill., is President, and R. W. Conant, Chief Engineer.

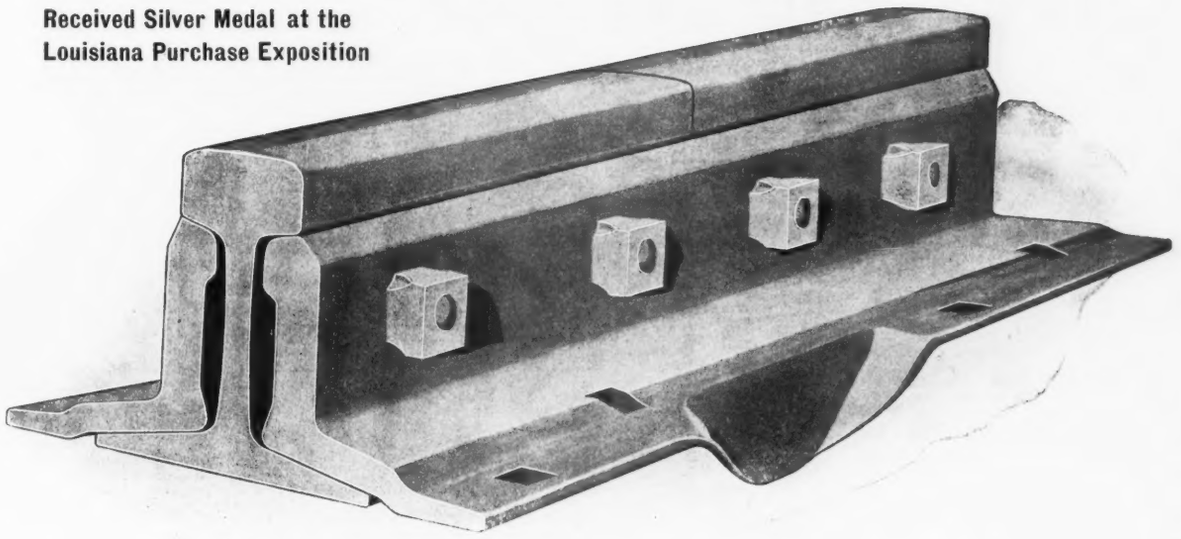
AVONDALE & CLEVELAND.—New line from Avondale, W. Va., northeast to Cleveland, 12 miles. C. A. Rouse, O. E. Swartz and A. E. Hugell, Clarksburg, W. Va., are incorporators. (Mar. 11, 1904.)

B

*BALTIMORE & BEL AIR (Electric).—Incorporated in Maryland to build from Baltimore to Bel Air, 19 miles; 3¼ miles completed and in operation under contract with United Railways

THE Q & C-BONZANO RAIL JOINT.

Received Silver Medal at the Louisiana Purchase Exposition



Gives a splice bar of the same approximate strength as the rail itself. This is necessary owing to the increased loads that are carried on the rails, which have been steadily increasing in size and strength, necessitating a strong, rigid joint.

Practically, the Q and C-Bonzano Joint is a re-enforced angle bar.

It is as strong as the unbroken rail.

Every Bonzano Joint performs the main functions of a rail brace and tie plate.

It is a money earner, saving in maintenance a large percentage over that of angle bars and other devices.

The Q & C-Bonzano Rail Joint can be successfully applied to old rail, making same like new.

There is absolutely no bending of rail members.

It affords protection to ties by not allowing abrasion.

No wear under head of rail.

The rail is kept in upright position.

This joint makes track noiseless.

This is absolutely an anti-creeper, owing to stiffness and double spiking.

The Q and C-Bonzano Rail Joint is truly a 100% joint.

The Oldsmobile Railroad Inspection Cars

made in two styles. The No. 1 car carrying 4 persons. The No. 2 carrying from 6 to 8 persons.

These cars are invaluable in Road, Bridge and Building Inspection. They also afford the most comfortable, prompt and economical means for superintendents and other division officers getting over their divisions.

THE GRAHAM COMBINED GUARD RAIL AND FROG BRACE
THE AMERICAN GUARD RAIL FASTENER
THE Q & C-RAIL ANTI-CREEPER
Q & C PORTABLE RAIL SAW
SAMSON RAIL BENDER

are of great value in the maintenance of way.

SEND FOR CATALOGS.

Railway Appliances Company,

SUCCEEDING Q & C CO.

General Offices, Old Colony Bldg., Chicago. **New York Office, 114 Liberty Street.**

& Electric Co. of Baltimore. S. A. Williams is President, and J. A. Shriver, General Manager, both of Bel Air, Md.

BALTIMORE & OHIO.—Cut-off from Hancock, Md., to Port Perry, Pa., 180 miles, which will be a saving of about 60 miles over the present route. Projected.

——*Enlargement of yards, rebuilding of the line and extension of second, third and fourth tracks at various points on the Pittsburg and Wheeling divisions. Work under way.

——*Terminal improvements at Washington, D. C. Contract let to McMullen & McDermott and the Hoffman Engineering & Constructing Co., Philadelphia. The work consists mainly in building the new railroad, from Montello, about four miles from Washington, on the Baltimore-Washington line, to the new terminal station at Massachusetts avenue, Washington. On the viaduct, from New York avenue to the terminal station, there will be 10 tracks. The contract includes not only the roadbed and bridges, but the freight terminal buildings, roundhouses and yard.

——Reported that this company intends to build a branch from Fairmont, W. Va., northeast via Catawba and Morgantown, W. Va., to Confluence, Pa., 50 miles.

——Projected branch line from a point near Girard, in Trumbull County, Ohio, on the old Pittsburg, Cleveland & Toledo, to a connection with the Fairport Division, in the same county.

——*This company is reported to be relaying about 15 miles of double track east of Bakerstown, on the old Pittsburg & Western, with 85-lb. rails.

BALTIMORE & SOUTHWESTERN.—Application made to the Maryland Legislature for a charter to build from Baltimore along the western shore of Chesapeake Bay to a point south of Annapolis, where connection will be made with the eastern shore by means of a ferry; also to extend the road to the Virginia State line and eventually to Norfolk, Va. F. E. Waters, R. B. Dixon and A. P. Gorman, Jr., are incorporators.

BALTIMORE & WASHINGTON TRANSIT.—Proposed "monorail" line from Washington, D. C., via Sandy Spring and St. Charles College to Baltimore, Md., 42 miles, with a projected extension from Washington to Gettysburg, Pa., 72 miles. Partly surveyed. Wm. A. Mellen, 1808 Kalorama, Washington, D. C., is a Director.

BANGOR & NORTHERN MAINE SHORT LINE.—Bill introduced in the Maine Legislature to incorporate this company to build a railroad from tidewater in the City of Bangor through Lagrange, Mattamiscontis, Medway and unorganized townships to Millinocket; also from a point in Mattawamkeag through Molunous, Macwahoc, Reed and Glenwood plantations and the towns of Amity and Hodgdon, into the town of Houlton, with a branch through Stacyville, Patten and unorganized townships to Presque Isle. Herbert M. Heath, of Augusta; George W. Maxfield, of Bangor, and Edward C. Stokes, of Trenton, N. J., are incorporators.

BARTOW & PLANT CITY.—Surveys made for a new railroad in Florida from Plant City, on the north, to Bartow and Fort Meade, by way of important phosphate mines in Polk County. President, Clarence A. Boswell; General Manager, Edward C. Stuart. (Mar. 11, 1904.)

*BASIN & ELLISTON.—Contracts reported let for grading, masonry and bridge work on this proposed line from Basin, Mont., to Elliston, 20 miles. The road will connect with the Northern Pacific and the Great Northern, and will open up a mining district. F. G. Lott, Basin, Mont., is General Manager.

BATAVIA & NORTHERN.—Proposed line from Batavia, N. Y., to Oak Orchard Harbor, 30 miles. Richard Schermerhorn, Chief Engineer. (Mar. 11, 1904.)

BATAVIA & WILLIAMSVILLE (Electric).—Proposed line from Batavia, N. Y., west to Williamsville, 20 miles. G. L. Lewis, Buffalo, N. Y., is President.

BATESVILLE & JACKSONPORT.—Projected road from Batesville, Ark., to Jacksonport, 22 miles. The new road will follow the line of the old Batesville & Brinckley Railroad for the greater part of the distance. H. Devereux, Little Rock, Ark., is President.

BATON ROUGE & NORTHEASTERN.—Organized in Louisiana to build from Baton Rouge, La., northeast to Grangeville, 30 miles. R. A. Hart is President, and J. L. Westbrook, Secretary, both of Baton Rouge, La.

BATTLE CREEK & GRAND RAPIDS INLAND LAKES TRACTION.—Incorporated in Michigan to build from Battle Creek through Gull Lake, Hickory Corners, Prairieville, Orangeville, Gunn Lake, Yankee Springs, Green Lake and Crosby to Grand Rapids, 65 miles. A. J. White, Battle Creek, is interested.

BAY CITY & CARO (Electric).—Incorporated in Michigan, to build an electric railroad from Bay City to Caro, 30 miles. E. A. Mather, Bay City, and F. Slocum, Caro, are directors.

*BAYFIELD, LAKE SHORE & WESTERN.—New line projected from Bayfield, Wis., to Superior, 65 miles. Work in progress between Racket Creek, Wis., and Cornucopia, seven miles. H. M. Juel is the contractor. Preliminary surveys in progress from Cornucopia to Port Wing, 18 miles. W. B. Westcott, Bayfield, Wis., may be addressed.

*BAY MINETTE & FORT MORGAN.—The first ten miles of this road from Bay Minette south has been completed, and about 70 per cent. of the grading to Foley, 37 miles. The work is light, with a maximum grade of 1 per cent. and a maximum curvature of 4 deg. The road will eventually be extended to Fort Morgan, 45 miles from Bay Minette. W. W. Olney, Bay Minette, Ala., is Chief Engineer.

BEAUMONT, SOUR LAKE & WESTERN.—This company has filed an amendment to its charter, changing the name from the Beaumont, Sour Lake and Port Arthur, organized to build from Port Arthur, Texas, via Beaumont to Sour Lake, 31 miles, to the above title. The amendment also provides for an extension to Houston. The company will build from Beaumont to Port Arthur and then to Batson and Houston. G. W. Meeker, Beaumont, Texas, is President.

BEAVER MEADOW, TRESCKOW & NEW BOSTON.—In operation from Beaver Meadow, Pa., to Tresckow, three miles. Chartered to extend from Tresckow to New Boston on the Pennsylvania, 21 miles. J. P. Pardee, of Hazleton, Pa., is President.

*BEE TREE.—The contract for building this proposed road from Swannanoa, N. C., to Craggy Mountain, eight miles; has been let to J. H. Hemphill & Co., of Marion. S. F. Chapman, Asheville, N. C., is said to be interested.

BELLINGHAM BAY & BRITISH COLUMBIA.—Reported that this road, which now runs from Bellingham Bay, Wash., north to Sumas, 22 miles, and from Sumas east to Glacier, 22 miles, will build from Sumas west to Blaine, in the northwest corner of Washington, 20 miles, at which point the company has recently purchased six blocks of tidewater lands at the mouth of Dakota Creek.

BELT LINE RAILROAD.—Projected line 29 miles long from North Bend, on Coos Bay, Coos County, Ore., through Empire and Marshfield to Glasgo. Surveys will be made this year. L. D. Kinney, Marshfield, Ore., is President.

BENNINGTON & GREAT BARRINGTON.—Chartered in Vermont to build from Bennington, Vt., south via Williamstown, Mass., to Great Barrington, 60 miles. C. H. Cutting and H. W. Clark, of North Adams, Mass., are incorporators. Surveys in progress. (Mar. 11, 1904.)

BETHEL GRANITE RAILROAD (CENTRAL VERMONT).—Incorporated in Vermont to build from a connection with the Central Vermont near Bethel to quarries about ten miles away. C. M. Hays, of the C. V., is President.

BIB BEND RAILROAD.—Proposed road in Washington from Ephrata, on the Great Northern, northwest to Chelan, 45 miles. W. J. Long, of Chelan, Wash., may be addressed.

BIG CREEK & THUNDER MOUNTAIN.—Organized in Idaho, with headquarters at Lardo, to build a logging road from Lardo east to Roosevelt, 60 miles.

*BIG HORN (C., B. & Q.).—This new line in Wyoming has given a contract to Bishop J. Jolly, of Basin, Wyoming, for building its line to the Shoshone reservation. The road is to run from Frannie, on the Toluca-Cody branch of the Chicago, Burlington & Quincy, across the Shoshone River at Lovell and thence through Ribbon Canyon and along the Big Horn River to Thermopolis.

*BINGHAMTON & LINEVILLE.—Grading has been completed on 6 miles of this proposed road from Lineville, Ala., west to Pyrlton, on the Talladega branch of the Louisville & Nashville, in Clay County, 10 miles, and track laying is to be begun this month. Contract for the remaining four miles to be let soon. R. L. Ivey, Ala., may be addressed.

BIRMINGHAM, MONTEREY & NEW ORLEANS.—Incorporated to build from Birmingham to Monterey, and to Meridian, Miss. Location surveys in progress, and it is expected that contracts for grading will soon be let. J. H. Smith is President, and J. E. White, Chief Engineer, both of Birmingham, Ala. (Mar. 11, 1904.)

BLACK BAYOU.—Charter granted this company in Texas to build from Myrtis, La., to Stanley, in Cass County, Tex., 25 miles. C. B. Crawford, Atlanta, Tex., and R. McMichael, Jefferson, Tex., are incorporators.

BLACK HILLS & NORTHWESTERN.—Incorporated in Washington to build from Olympia into the Quinault Indian reservation in Chehalis County, Wash., about 100 miles. Lester Turner, Seattle, Wash., is interested. (Mar. 11, 1904.)

BLACK HILLS & WYOMING.—Location surveys have been completed for building this line from Rapid City, S. Dak., to Mystic, 35 miles. Reported that grading will be begun at once. This company has bought the Dakota, Wyoming & Missouri River, which had eight miles graded between Rapid City and Mystic. C. D. Crouch, Akron, Ohio, is President, and F. C. Tucker, Deadwood, S. Dak., is Chief Engineer.

BLACK LICK & YELLOW CREEK.—Incorporated in Pennsylvania to build a road from Rexis, in Indiana County, to Burns Summit, 10 miles. A. W. Lee, Clearville, Pa., is President.

BLACKSTONE & LUNENBURG.—Incorporated in Virginia to build from Blackstone, Nottoway County, southwest into Lunenburg County. Freeman Epes is President, and T. M. Dillard, Secretary, Blackstone, Va.

BLACKWELL, FAIRMOUNT & SOUTHERN.—Chartered in Oklahoma to build from Blackwell to El Reno, 100 miles. T. S. Chambers, D. S. Rose, and others, of Blackwell, are incorporators. (Mar. 11, 1904.)

*BLUEFIELD & WIDEMOUTH (Electric).—The proposed route of this road is from Bluefield, W. Va., through Ormiston to Widemouth, 18 miles. Grading in progress between Graham and Bluefield, 3¼ miles, by the contractors, Long & Bryan, of Bluefield.

BOCA & LOYALTON.—The proposed route of this road is from Boca, Cal., northwesterly via Beckwith Pass, Spring Garden Creek and Spanish Creek, to Quincy, 80 miles, with a branch from Beckwith Pass to a point at the head of Indian Creek, in Plumas County, 30 miles. Eight miles completed last year. J. W. Roberts, P. J. Harney and R. H. Lewis, of Boca, Cal., are incorporators.

BODCAU VALLEY.—Incorporated in Louisiana to build from Alden Bridge, on the St. Louis Southwestern, Bossier County, east to Ivan, 10 miles. H. H. Wells, Benton, La., is President.

*BOISE, NAMPA & OWYHEE.—Extension now being built under the charter of the Idaho Northern, from Emmet to Garden Valley, 45 miles. J. M. Clark, Nampa, Idaho, is General Superintendent. (Mar. 11, 1904.)

BOSTON & ALBANY (N. Y. C. & H. R.).—Plans made for building about 10 miles of new track in the West Springfield yard, in which traffic is frequently congested. About half of this track will be laid at once.

——Work will be begun at once on rock ballasting the road between Palmer and Warren, 10 miles; Westfield and Hinsdale, 33 miles, and Chatham and Albany, 23 miles.

BOSTON & WORCESTER (Electric).—This company will complete the double-tracking of its line between Boston and Worcester by laying a second track on five miles of road between Southboro and Framingham.

——An extension of 1¼ miles into Natick will be built, at an estimated cost of $150,000.

BOSTON ELEVATED.—This company is arranging to build an elevated extension from Guild Street, Boston, to Forest Hills, about 2½ miles. G. A. Kimball, 101 Milk Street, Boston, is Chief Engineer.

BOSTON, PAWTUCKET & PROVIDENCE (Electric).—The Boston & Suburban and the Boston & Worcester electric companies are reported to be interested in a new corporation under this name which proposes to build an air line high-speed electric road extending from the Forest Hills terminal of the Boston Elevated Railroad to the Rhode Island boundary, and thence through Pawtucket to Providence.

BOSQUEVILLE RAILROAD.—Surveys reported for this new line from Waco, Tex., via Bosqueville and Meridian to Stephenville, 80 miles. P. A. McCarthy, Lufkin, Tex., is interested.

BOWIE, LAFOURCHE & NORTHWESTERN.—Proposed line from Bowie, La., to Thibodaux, 12 miles. Surveys completed. J. R. Downman, New Orleans, La., is Chief Engineer. (Mar. 11, 1904.)

BOWMAN CREEK.—Incorporated in West Virginia, to build from Boomer, Fayette County, W. Va., to the junction of the Great Kanawha and Gauley Rivers. W. C. Merrick, W. B. Stuart and R. H. Crowell, of Cleveland, Ohio, are incorporators. (Mar. 11, 1904.)

BRINKLEY & MARIANNA.—Organized to build between these two points in Arkansas, 31 miles. Rights of way secured. H. F. Roleson, of Marianna, is interested. (Mar. 11, 1904.)

BROOKHAVEN & PEARL RIVER.—Proposed line in Mississippi from Brookhaven, Miss., southeast to a point on Pearl River, 20 miles. S. E. Morton, S. J. Carpenter and D. J. Batchelder, Jr., of Brookhaven, are incorporators.

BRUNSWICK & BIRMINGHAM (ATLANTIC & BIRMINGHAM).—Extension from Irwinville, Ga., west to Worth, 20 miles. Projected. L. W. Robert, Brunswick, Ga., is President. (Mar. 11, 1904.)

BRUSH VALLEY.—Chartered in Pennsylvania to build from Foust's Mills, Indiana County, to the mouth of Brush Creek, 5 miles. J. W. Irish, Norristown, Pa., is interested. (Mar. 11, 1904.)

BUCKHANNON & NORTHERN.—New line from Bellington, W. Va., north to New Brownsville, Monongalia County, 60 miles. About 30 miles have been graded, but work has been suspended. S. D. Brady, Parkersburg, W. Va., is Chief Engineer. (Mar. 11, 1904.)

BUFFALO & ROCHESTER (Electric).—Incorporated in New York to build an electric railroad from Depew, in Erie County, to Rochester, 60 miles, with headquarters at Depew. W. B. Cutter, of Buffalo, N. Y., is interested.

BUFFALO & SOUTHEASTERN (Electric).—Incorporated in New York, to build an electric railroad from East Aurora northwesterly through Spring Brook and Ebenezer to Buffalo, 12½ miles, with an extension from East Aurora to Java, 15 miles. F. H. Ball and E. E. Henshaw, of East Aurora, N. Y., are incorporators.

BUFFALO & SUSQUEHANNA.—Extension from Juneau, Indiana County, Pa., to which place the company has a trackage agreement from Stanley, Clearfield County, 15 miles, southwest to Plumville, 15 miles. Financial plans made.

BUFFALO, BATAVIA & ROCHESTER (Electric).—Incorporated in New York, with headquarters at Buffalo, to build an electric railroad from Williamsville, Erie County, N. Y., to Rochester, 65 miles, with a branch to Akron. W. N. Evarts, E. E. Lewis, Jr., and G. E. Pierce, of Buffalo, are incorporators.

BUFFALO CREEK & GAULEY.—Proposed line in West Virginia from Clay Court House southeast to Camden-on-Gauley, 30 miles. J. M. Cameron and J. Y. Boyd are incorporators.

*BUFFALO, DUNKIRK & WESTERN.—New line building between Fredonia, N. Y., and Westfield. Under contract to J. E. Latimer, 203 Ellicott Square, Buffalo, N. Y. (Mar. 11, 1904.)

BUFFALO FRONTIER TERMINAL.—Incorporated to build a steam railroad 30 miles long in Erie County, from Hamburg, on Lake Erie, northerly through Buffalo to the Niagara River at Tonawanda. W. B. Cutler, C. W. Goodyear, F. H. Goodyear, A. D. Bissell, C. R. Huntley, and G. S. Field, of Buffalo, N. Y., are incorporators. (Mar. 11, 1904.)

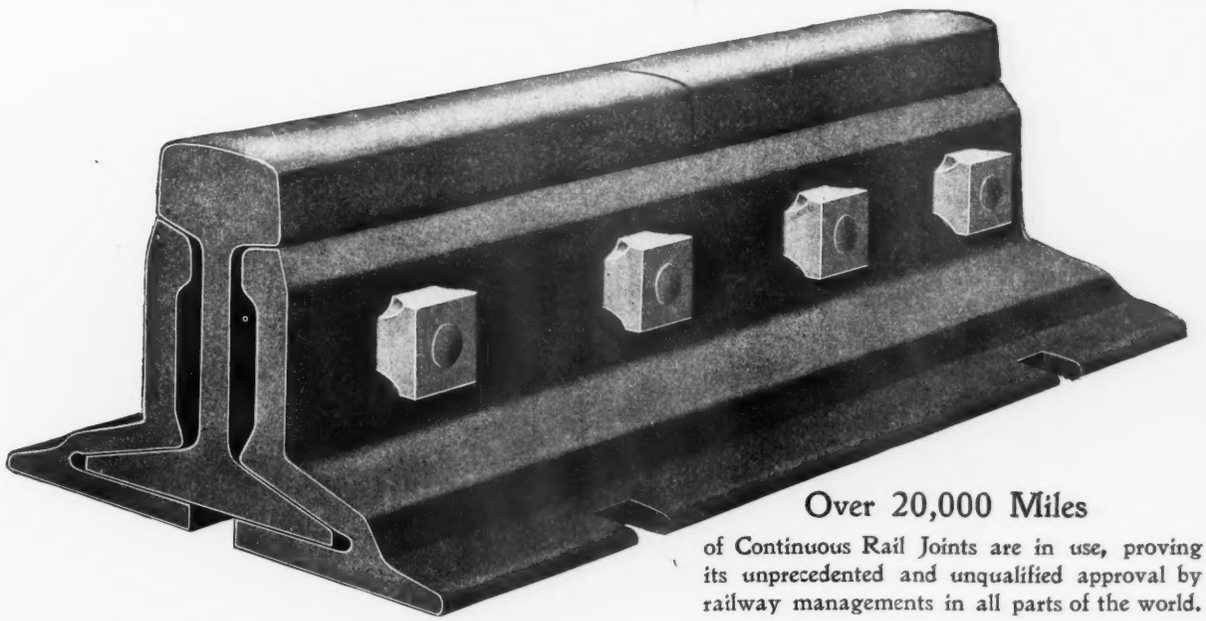
BUFFALO UNION TERMINAL.—Incorporated in New York, to build a steam railroad seven miles long in Buffalo. F. C. Mosedale, C. A. Collins and Bernard Marron, all of Buffalo, are directors.

BUREAU COUNTY MINERAL.—Charter granted in Illinois, to build from a point on the western line of Bureau County to a point in the northern part of the same county. W. D. Millard, S. B. Stubbs and B. A. Dousman, of Chicago, are incorporators.

BURKESVILLE, GLASGOW & CUMBERLAND VALLEY.—Incorporated in Kentucky, to build from Glasgow via Edmonton to Burkesville, 75 miles. (Mar. 11, 1904.)

BURLINGTON & SOUTHEASTERN.—Incorporated in Vermont, to build from Mallet's Bay, C

St. Louis Exposition, 1904, awarded us the only Gold Medal for rail joint products, the highest award.



Over 20,000 Miles

of Continuous Rail Joints are in use, proving its unprecedented and unqualified approval by railway managements in all parts of the world.

Continuous Rail Joint Co. of Am.

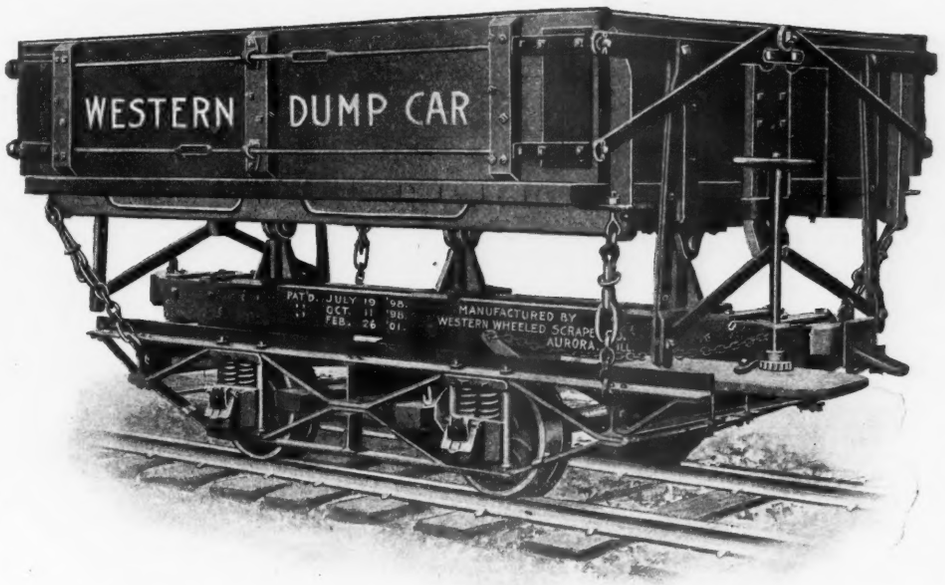
NEWARK, N. J., U. S. A.

Makers of Rail Joints, Step Joints, Insulated Joints, and Electric Bonding Joints, all of the Continuous Type.

BRANCH SELLING AGENCIES

BALTIMORE, MD., 322 North Charles St.
BOSTON, MASS., John Hancock Bldg.
CHICAGO, ILL., Monadnock Bldg.
DENVER, COL., Equitable Bldg.
LONDON, E. C., ENGLAND, 20 King William St.
MONTREAL, CAN., Board of Trade Bldg.
ST. LOUIS, MO., Commonwealth Trust Bldg.
ST. PAUL, MINN., Pioneer Press Bldg.
SEATTLE, WASH., Washington Bldg.

WESTERN DUMP CARS



4 Yard Car, 36" Gauge

Automatic Endgates :: ::
Wide Discharge Openings
Low Construction :: :: ::
Freedom from Derailment

All Sizes
1¼ yard to 10 yards

Write for particulars as to the late improvements

WESTERN WHEELED SCRAPER COMPANY

Earth and Stone Handling Machinery

AURORA ILLINOIS

chester County, through Chittenden, Addison, Rutland and Windsor counties to Windsor, 150 miles. E. C. Mower and F. O. Sinclair, Burlington, Vt., are directors. (Mar. 11, 1904.)

BURNSIDE & CINCINNATI.—Incorporated in Kentucky, to build from the Cincinnati Southern at Burnside, to the mouth of South Fork River. R. K. Cole and L. N. Garth, of Cincinnati, are incorporators. (Mar. 11, 1904.)

BUTTE & SALMON RIVER (Electric).—New line from Butte, Mont., south through Silver Bow and Beaverhead counties to the mouth of Horse Prairie Creek, then west through Lemhi Pass into Lemhi County, Idaho, to a point on Salmon River near the mouth of North Fork, 190 miles. P. B. Morse and H. W. Rowley, of Billings, Mont., are directors. (Mar. 11, 1904.)

C

*CACHE VALLEY.—This company, which now operates a freight line from Sedgwick, Ark., to Light, 15 miles, is building an extension from Light northeast to Stonewall, 15 miles. Work is being done by the company's forces. When this is completed, the company plans to build a further extension of 20 miles to Chalk Bluff. E. W. Culver, Sedgwick, Ark., is President.

CALCASIEU & GREAT NORTHERN.—New line from Lake Charles, La., north to a point on the Texas & Pacific. Surveyed. J. T. Shutts, Lake Charles, La., is in charge. (Mar. 11, 1904.)

CALIFORNIA & ARIZONA.—Incorporated in Oklahoma Territory with headquarters at Guthrie, to build a road, the projected route of which is not stated. J. Alexander and J. E. Nicholson, of San Francisco, and G. B. Pattison, Guthrie, Okla. T., are incorporators.

CALIFORNIA & OREGON COAST.—Proposed line from Grant's Pass, Ore., southwest through Wilderville and Kerby to Crescent City, Cal., 91 miles. The work will be heavy, with a maximum grade of 2 per cent. and a maximum curvature of 12 degrees, and will include five tunnels from 250 ft. to 3,200 ft. long. Two branches from the main line are projected: One via Smith River to Chetco, Ore., and the other via Requa to Redwood. James B. Gunn is President, and T. W. M. Dreyer, 230 Montgomery Street, San Francisco, Cal., Chief Engineer.

CALIFORNIA MIDLAND.—Proposed line from San Francisco to a point near the mouth of Kings Creek, a branch of the San Joaquin, 200 miles, with a branch from a point on the main line near Madera to Bakersfield, 115 miles. Preliminary surveys for this branch have already been made and contracts are to be let. W. H. H. Hurd is President.

CALIFORNIA NORTHWESTERN.—Branch from main line near Ukiah, Mendocino County, Cal., west to Christine, 14 miles. Proposed.

——Work will soon be begun on the reconstruction of the Donahue branch of this road, which runs from Petaluma, Cal., through Lakeville to Donahue, 6½ miles. The entire line will be rebuilt, and the work will include a new wharf at Donahue. F. K. Zook, Tiburon, Cal., is Chief Engineer.

CALIFORNIA ROADS.—The Pacific Steel Co., organized in California, plans to build a railroad from San Diego, Cal., to La Paz., Mexico, traversing the whole southern part of the peninsula of Lower California. The headquarters of the company are at San Diego.

——Proposed railroad from Visalia, Cal., east to Farmsville, and northeast to Exeter and Lemon Grove, 10 miles. J. H. Hammond, New York, is said to be interested. (Mar. 11, 1904.)

CAMBRIA SOUTHERN.—Chartered in Tennessee with headquarters at Knoxville, to build from Cave Creek, on the Atlanta, Knoxville & Northern Division of the Louisville & Nashville, to a point in Polk County, Georgia, near the Conesauga River. H. W. Oliver and J. H. Frantz are incorporators.

CAMDEN SOUTHERN.—Proposed line in Michigan, from a point in Amboy Township, Hillsdale County, on the Ohio and Michigan State line, to Coldwater, Branch County, about 32 miles. John Reek, of Camden, Mich., is President. Nothing done. (Mar. 11, 1904.)

CANADIAN VALLEY & WESTERN.—Chartered in Oklahoma Territory, to build from Coalgate, Ind. T., to Clinton, Okla. T., 160 miles. The line as projected will run through Tupalo, Purcell, Chickasaw and Weatherford. Surveys of the entire line reported finished. D. Carter, Purcell, Ind. T., is President, and R. L. McWillie, Chief Engineer.

CANEY & WEST LIBERTY.—Incorporated in Kentucky, to build from Cannel City, in Morgan County, Ky., through Caney to West Liberty, eight miles. W. N. Reed, C. M. Martin and W. B. Smith, of Paducah, Ky., are incorporators.

CANTON & YOUNGSTOWN.—Incorporated in Ohio to build from Canton through Stark, Mahoning and Portage counties to Youngstown. W. A. Clark, of Canton, Ohio, is interested.

CANTON, ABERDEEN & NASHVILLE (ILLINOIS CENTRAL).—Charter amended providing for an extension from Brilliant, Ala., northeast to Double Springs, thence northwest to Sheffield, and along the Tennessee River to the Mississippi State line, 90 miles. (Mar. 11, 1904.)

CANYON CITY & GREAT NORTHERN.—Officers of this company, incorporated about a year ago, express the intention of soon beginning construction. The proposed line is from the Cuckoo coal fields near Florence, Colo., to El Paso, Tex., 760 miles.

CAROLINA & NORTHWESTERN.—Extension From Lenoir, N. C., to Carey's Flats, 35 miles, projected. J. R. Ervin, Lenoir, N. C., is Chief Engineer. (Mar. 11, 1904.)

——*Extension from Freeland, N. C., to the top of Blue Ridge Mountains, 45 miles. Surveys finished and contracts let. (Mar. 11, 1904.)

*CAROLINA & WESTERN.—New line from Fechtig, S. C., to Tillman, S. C., 22 miles. Track laid for a distance of eight miles. W. F. Cummings, of Hampton, S. C., is President. (Mar. 11, 1904.)

CASPAR, SOUTH FORK & EASTERN.—Proposed line from Caspar, Cal., east to Willits, 35 miles. Will be built by the company's forces. Surveyed and about three miles of track out of Caspar has been laid. A. E. Krebs, San Francisco, is President, and R. S. Andrews, Caspar, Cal., Chief Engineer.

CATLIN & NORTHERN.—Incorporated in Illinois to build from Catlin, on the Wabash, northwest to Oakwood, on the Cleveland, Cincinnati, Chicago & St. Louis, six miles. L. E. Fisher, G. T. Buckingham and W. V. Dysert, all of Danville, Ill., are incorporators.

CAYUGA LAKE & ITHACA.—Incorporated in New York, to build from Ithaca to Ludlowville, 7½ miles. J. W. Wright, Dryden, N. Y., and E. A. Dender, Ithaca, N. Y., are interested.

CECIL & ASTOR.—Proposed line in West Virginia between these two points, eight miles. C. A. Young, Robson, W. Va.; W. T. Gates, Astor, W. Va., and W. J. Elgin, Kanawha Falls, W. Va., are incorporators.

CEDAR FALLS & NORTHEASTERN (ILLINOIS CENTRAL).—Incorporated in Iowa, to build about two miles of road connecting the Dubuque & Sioux City at a point near Cedar Falls with the Cedar Falls & Minnesota, at a point near Jamesville. Stuyvesant Fish is President; J. C. Welling, First Vice-President, and J. T. Harahan, Second Vice-President.

CEDAR RAPIDS & IOWA CITY (Electric).—Extension from Iowa City to Burlington. Proposed.

CEDAR RAPIDS, WATERLOO & NORTHERN.—Proposed line in Iowa, from Cedar Rapids, Iowa, northwest to Waterloo, 50 miles. L. M. Rupert is President; T. A. Berkebile, Vice-President, and E. A. Crocker, Secretary, all of Cedar Rapids, Iowa.

CENTRAL CALIFORNIA.—Incorporated in California, to build from Newark, in Alameda County, west to San Francisco Bay at Potraro Point, and thence across the bay to San Mateo, 15 miles. M. T. Smith, William Hood and J. E. Foulds are interested. Said to be a Southern Pacific project.

CENTRAL FLORIDA & INDIAN RIVER.—Location surveys in progress for this railroad from Melbourne, Fla., northwest to Orlando and west to Barton, 125 miles. W. T. Wells, Melbourne, and E. O. Painter, Jacksonville, are interested.

CENTRAL ILLINOIS INTERURBAN.—Incorporated in Illinois, with principal office at Mason City, to build an electric line from Peoria south to Pekin, eight miles, thence south to Mason City, Lincoln and Springfield, 70 miles. John B. Abbott, Paul A. Emrows and Claude L. Stone, of Mason City, are incorporators.

CENTRAL INDIANA TRACTION.—Incorporated in Indiana, to build an interurban line from Peru, Ind., to South Bend. James O. Cole, of Peru, is President.

CENTRAL OHIO & NORTHWESTERN.—Proposed line in Ohio from Meridian, Ohio, on the Cleveland, Cincinnati, Chicago & St. Louis and the Erie, southeast to Zanesville, on the Baltimore & Ohio, 100 miles.

CENTRAL VERMONT.—Extension from Bethel, Vt., to granite quarries, five miles. The ruling grade ascending to the quarries would be 3.5 per cent., compensated for by curvature, and the maximum curvature about 8 deg. Projected. See Bethel Granite Railroad.

——Line of the old Brattleboro & Whitehall, which runs from Brattleboro, Vt., northwest to South Londonderry, 36 miles, to be made standard gage. In connection with this work, an extension may be built from South Londonderry into a large timber district.

CHARLESTON & SUMMERVILLE (Electric).—Incorporated in South Carolina with Ogden Edwards, of Troy, Ohio, as President, and R. J. Smith, of Summerville, as Vice-President and General Manager, to build an electric road from Charleston northwest to Summerville, 24 miles, paralleling the Southern.

CHARLESTON, CHAMPAIGN & NORTHERN.—Proposed line in Illinois from Charleston, Ill., northeast to Homer, 40 miles. Connection will be made with the Wabash at Homer, and with the Cleveland, Cincinnati, Chicago & St. Louis, and the Toledo, St. Louis & Western at Charleston. W. R. Patton, W. F. Jenkins, J. B. Mitchell and C. L. Lee, of Charleston, are incorporators.

CHATTANOOGA & AUGUSTA.—Surveys will soon be begun for this proposed road from Augusta northwest to Elberton, Ga., 70 miles. The company was incorporated several years ago, but little work has ever been done.

CHATTANOOGA & MONTLAKE.—Proposed line in Tennessee from the mines of the Montlake Coal Co., in Chickamauga Gulch, near Daisy, to Chattanooga, 20 miles. G. W. Nixon, President of the Montlake Coal Co., is interested.

CHEBOYGAN SOUTHERN.—Incorporated in Michigan, with headquarters at Cheboygan, to build from Cheboygan southwest through the counties of Cheboygan and Emmett to Pellston, 20 miles. Col. Chas. Bogardus, Pellston, Mich.; H. W. Carey, Eastlake, Mich., and R. B. Gillette, Benton Harbor, Mich., are incorporators.

CHELAN RAILROAD & NAVIGATION COMPANY.—Incorporated in the State of Washington to build from Pateros, south via Chelan Falls to Wenatchee, 50 miles. The company will also run steamboats on the Columbia River and Okanogan River, and on Lake Chelan. R. D. Johnson, Chelan, Wash., is Vice-President and General Manager. (Mar. 11, 1904.)

CHEROKEE, SPARTANBURG & UNION (Electric).—A bill has been introduced in the South Carolina Legislature to incorporate this company to build an electric road connecting Union, Spartanburg and Gaffney, S. C., and Asheville, N. C. A. N. Wood and T. B. Butler, of Gaffney, and John B. Cleveland and W. H. Hamrick, of Spartanburg, are incorporators.

*CHERRY TREE & DIXONVILLE (PENNSYLVANIA-NEW YORK CENTRAL).—This road, which is being built by the Pennsylvania and the New York Central jointly, has been opened for traffic between Cherry Tree, Pa., and Possum Glory Junction, 21 miles. It will be operated as a part of the Susquehanna extension of the Cambria & Clearfield Division of the Pennsylvania, and will open up extensive coal lands in Indiana County. Work now in progress on an extension from Possum Glory Junction to Dixonville.

CHERRY VALLEY.—Incorporated in Ohio, with headquarters at Leetonia, Ohio. E. M. Peters, H. G. Forsythe, W. G. Lodge, M. A. Taylor, and A. J. Sevenich are incorporators.

*CHESAPEAKE & OHIO.—The Big Sandy extension, from Whitehouse, Ky., to Elkhorn City, 77 miles, is in operation as far as Pikeville, 43 miles. It is expected to have the line completed to Elkhorn City this spring. The maximum grade is 0.2 per cent. and the maximum curvature is 8 degrees. There will be eleven steel bridges and one 400-ft. tunnel. Langhorne, Johnson & Co., of Richmond, Va., are the contractors. F. I. Cabell, Engineer of Construction, is in charge.

——*Work in progress on three extensions. One of these is from the Guyandotte River to Logan and the other two leave the main line between Hinton and Charleston, and extend to the head waters of the Coal and Guyandotte Rivers, respectively.

——*New branch from Raleigh, W. Va., to Birchfield, 22 miles. Track laid for about 11 miles last year. Surveys completed, and contract let to Carpenter & Co., of Raleigh.

*CHESHIRE STREET.—Contract let to Ley ——See Ronceverte, Lewisburg & Western. Brothers, Springfield, Mass., for building from Waterbury, Conn., to Cheshire. The work includes the excavation of 160,000 cu. yds. of earth, 30,000 cu. yds. of rock excavation, 2,500 yds. of concrete masonry, and 2,500 yds. of rubble masonry.

CHESTER, PERRYVILLE & STE. GENEVIEVE.—Extension from West Chester, Mo., to Frederickton, 30 miles. Surveys completed. J. C. Houck, Perryville, Mo., is Superintendent. (Mar. 11, 1904.)

CHESTERFIELD & LANCASTER.—Extension from Ruby, S. C., to Plains, 15 miles. Surveys in progress, but no grading done. W. F. Stevens is President. (Mar. 11, 1904.)

CHEYENNE & WICHITA VALLEY.—New line from Canadian, Tex., to Chickasha, Ind. T., 180 miles. Surveys finished between Cheyenne, Okla. T., and Clinton, 45 miles, and contracts for grading will shortly be let. J. B. Harrison is President; H. D. Fox, Vice-President, and J. P. Johnson, Secretary, all of Cheyenne, Okla. T. (Mar. 11, 1904.)

CHICAGO & CENTRAL ILLINOIS.—Proposed new line in Illinois from Chicago through Harvey, Homewood and Mattison to Kankakee. W. R. Reed, C. F. Davies, W. H. Borris and M. W. Hamford, all of Chicago, are named as incorporators.

*CHICAGO & INTERURBAN (Electric).—This company, successor to the Blue Island, Riverdale & Hammond, has under contract to the Western Electrical Supply Co., of St. Louis, the building of its proposed lines from Chicago, via Harvey, Thornton and South Harvey, to Chicago Heights, 14 miles, and from Blue Island through Riverdale, Dolton and West Hammond, Ill., 7½ miles. Grading is completed from Chicago to Harvey, seven miles, and from Dolton to West Hammond, two miles. A. H. Miller, of Chicago, is President.

CHICAGO & MILWAUKEE (Electric).—Proposed electric line in Wisconsin from a point on the State line between Illinois and Wisconsin, near Pleasant Springs, Kenosha County, to Milwaukee, passing through the counties of Kenosha, Racine and Milwaukee. Albert C. Frost, Chicago, is said to be interested.

CHICAGO & NORTHERN INDIANA (Electric). Proposed electric line from Logansport, Ind., through Sheridan, Kempton and Russiaville. The work will be light, with a maximum grade of 0.5 per cent. and a maximum curvature of 3 deg. There will be four bridges. The line will be built under standard steam specifications, and will carry all classes of freight as well as passengers. Lester Soule, Indianapolis, Ind., is President.

CHICAGO & NORTHWESTERN.—Officials of this company have incorporated the Wyoming & Northwestern as an extension of the Chicago & North Western's Wyoming line, from Caspar, Wyoming, west to the Big Horn River. Surveys made from Casper, Wyo., to Lander and Thermopolis, and rights of way secured across the Wind River reservation to Lander. By this extension, the North Western will reach the Big Horn basin in Wyoming and the Shoshone reservation, which is to be opened to settlement next spring.

——Branch line from a point near Mercer, Iron County, Wis., northeasterly to a point on the boundary line between the States of Wisconsin and Michigan, 25 miles. Projected.

——*Construction reported under way on a cut-off from Manitowoc, Wis., north to Green Bay, 35 miles.

——Reported that this company will build new yards, at a cost of $500,000, at Melrose Park, 12 miles west of Chicago, to relieve freight congestion.

——*Contract reported let to Winston Bros. Co., Minneapolis, and A. D. McDougall, Milwaukee, for a branch road from Saunders, Mich., south to Laona, Wis., 32 miles.

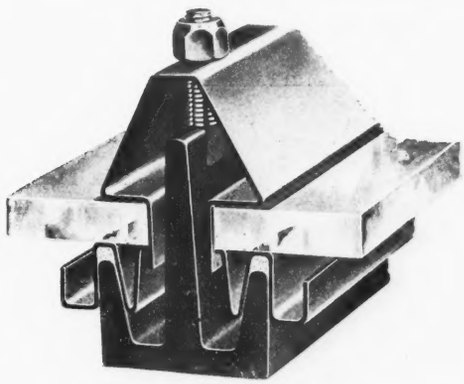
——See Manitowoc & Green Bay.

CHICAGO & NORTHWESTERN LAKES (Electric).—Proposed line from Chicago northwest to Kilbourn, Wis., 160 miles, passing through Mt. Henry County in Illinois, and Kenosha, Walworth, Jefferson and Dane counties in Wisconsin.

THE NATIONAL SYSTEM
Steel Puttyless Skylights

(PATENTS ALLOWED AND PENDING)

Perfected Roof Lighting
Side Lighting
and
Fireproof Sash
for
Buildings of Every Kind



Standard Cross Section

Durable, Dustproof
Watertight
Permits Expansion
Proof Against Vibration
No Filling Substance
No Broken Glass

SPECIAL FEATURES OF THE NATIONAL SYSTEM

ROLLED STEEL SUPPORTING BARS, combining maximum strength and minimum weight, and also providing for enclosed gutters.

STEEL EXPANSION CLIPS, allowing the steel supporting bars to expand and contract and to move freely when affected by expansion or vibration, thus obviating the breakage of glass.

CONDENSATION GUTTERS, providing permanently flexible and yielding bearings for the glass, and delivering the condensation out through the eave gutters.

CROSS GUTTERS, furnishing a dust-proof spring joint between each lap of glass.

SETTING OF THE GLASS, so that each light is independent of every other, and seated on a flexible bearing surface, never comes in contact with a rigid surface, and is left wholly free to move whenever affected by either expansion, contraction or vibration.

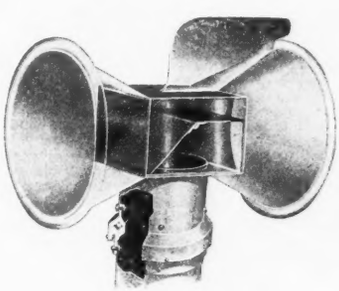
SPRING SURFACE BEARING CAPS, providing a broad surface, bearing upon the glass with sheet-lead intervening, in a resilient or spring-like manner, and forming a water-proof contact; while the vertical legs of the caps keep the glass free from binding or coming in contact with any rigid surface.

PUTTYLESS GLAZING, being wholly free from the use of putty, roof cement or any other filling substance, which would bind the glass, causing breakage, and which must of necessity crack and disintegrate in time, causing leakage and expensive repairs.

Superiority and Cost of Construction

The cost of construction under the National System of Steel Puttyless Glazing is moderate. Because of this fact and of superior excellence it meets all requirements wherever permanent water-tight skylight or other steel and glass construction is required.

Estimates and sketches submitted on request.



Ariel Ventilator

National System of Ventilation

FOR RAILWAY AND TROLLEY CARS AND BUILDINGS OF EVERY CLASS

Railway Stations, Power Houses, Machine Shops, Warehouses, Mills, Factories, Tanneries, Schools, Churches, Hospitals, Theatres, Public and Office Buildings, Dwelling Houses, Apartments, Etc., Etc.

CAR VENTILATORS, for deck windows and roofs, automatic in action and of tried efficiency, that exclude rain, snow, dust, smoke and cinders.

WINDOW DEVICES, also automatic, that provide a continuous supply of fresh air free from draughts and from the admission of dust—*specially adapted for fireproof buildings, since no sparks can enter.*

THE ARIEL VENTILATOR, an automatic, ball-bearing valve device, weather-proof, for use on smoke flues, ventilating shafts, roofs and skylights—*a perfect exhaust.*

Eleven Different Devices to Meet Varying Conditions

MANUFACTURED BY THE

National Ventilating Company

General Office: 1 Madison Avenue, New York City

Pittsburg Office: 715 Empire Building **Baltimore Office: 109 Lobe Building** **Boston Office: 101 Tremont Street**

sin. Alexander Clark, Chicago, and E. P. Wheeler, Lake Geneva, Wis., are incorporators. (Mar. 11, 1904.)

CHICAGO & PACIFIC.—Incorporated in Wyoming to build from Casper, Wyo., southwest to Ogden, Utah, about 400 miles. J. B. Bradley and W. B. Rhodes, of Casper, are interested. It is said to be a project of the Chicago & North Western.

CHICAGO & SOUTHWESTERN TRACTION.—Incorporated in Illinois to build an electric road from Morris, Grundy County, north to Yorkville, Kendall County, 20 miles. William T. Kopf, Frederick W. Hill and Horace W. Nichols, Jr., all of Chicago, are directors.

CHICAGO & STATE LINE (C. & N. W.).—Incorporated in Illinois by officers of the Chicago & North Western to build from a connection with that road at Lake Bluff, Ill., to the Wisconsin State line.

*CHICAGO, ANAMOSA & NORTHERN.—New line from Anamosa, Iowa, via Prairieburg, Coggan, Quasqueton and Independence to Waterloo, 73 miles. Grading and track laying finished from Anamosa to Coggan, 20 miles. John Foley, of Anamosa, is the contractor for this section. It is expected to have the line finished as far as Quasqueton, Buchanan County, this year. Contracts for this section to be let at once. The work will require six steel bridges. Henry Kiene, Dubuque, Iowa, is President, and J. F. Lacord, Anamosa, Iowa, is Chief Engineer.

CHICAGO, BURLINGTON & QUINCY.—This company now has a second track across the State of Iowa from Burlington to Pacific Junction, with the exception of three miles between Charlton and Lucas, Iowa, and about 11 miles from the top of the hill west of Hastings to Glenwood. These two sections will be double tracked this spring. The length of the new line, from Burlington to Pacific Junction, is 269½ miles, as compared with 276 miles by the old route.

——*New freight yards at East Des Moines, Iowa. Work reported in progress.

——*New passing tracks between Akron, Colo., and Lincoln, Neb. Work reported in progress.

——See Big Horn.

CHICAGO, CINCINNATI & LOUISVILLE.—New line from Cincinnati, Ohio, via Madison, Ind., to Louisville, Ky. Contracts to be let soon. H. L. Jackson, Madison, Ind., is Chief Engineer. (Mar. 11, 1904.)

CHICAGO GREAT WESTERN.—Extension of the De Kalb & Great Western branch from a point on the main line in Ogle County, Ill., through the counties of Ogle, Lee, Bureau, Putnam, Marshall and Tazewell to Peoria, 120 miles. Proposed.

——About 55 miles of track will be relaid with 85-lb. steel rails.

——*Contracts let to the Lorimer-Gallagher Construction Co., of Chicago, for revision of eight miles of the line south of Renova, Minn.

CHICAGO, JOLIET & IOWA.—Reported that 65 miles of the right of way have been secured. The proposed route is from Chicago through Will, Kendall, La Salle, Stark and Warren counties to Monmouth, Ill., 170 miles, with a branch from Keithsburg, on the Mississippi River, to Muscatine, Iowa. Reported that grading will shortly be begun. The headquarters of the company are at Chicago.

CHICAGO, ROCK ISLAND & PACIFIC.—See Choctaw, Oklahoma & Gulf.

——See Little Rock & Southern.

——See New Orleans Terminal.

*OMAHA (CHICAGO NORTH WESTERN).—Extension from Winter, Wis., east 10 miles, under contract to Winter Bros. Co., of Minneapolis, Minn.

——Spur track in Sioux City along the surface of Third Street from Wall Street to Jones Street, with spurs into intersecting streets. Proposed to City Council.

*CHICAGO SOUTHERN.—This company, incorporated in September in Illinois to build from Terre Haute, Ind., north to Chicago, 170 miles, is reported to have let a contract to the People's Construction Co., of Davenport, Ia., for concrete work, bridges and abutments on 27 miles of line. An order for 250 gondolas has been placed with Barney & Smith.

CHICAGO, WEATHERFORD & BRAZOS VALLEY.—Surveys reported under way for this road, projected to run from Weatherford, Tex., north to Bridgeport, 36 miles. George M. Bowie, of Weatherford, is interested.

CHICO & NORTHERN.—Incorporated in California, to build from a point one mile south of Chico, northwest to Sterling, 32 miles. J. W. Helman and H. M. Holbrook, San Francisco, and C. A. Harp, Stockton, Cal., are incorporators. (Mar. 11, 1904.)

CHILLICOTHE, BAINBRIDGE & ABERDEEN.—Incorporated in Ohio by G. F. Horn, A. A. Luther and others, of Chillicothe, Ohio. The proposed route of the road is not stated.

*CHOCTAW, OKLAHOMA & GULF (CHICAGO, ROCK ISLAND & PACIFIC).—Extension from Amarillo, Tex., west via Las Vegas to Tucumcari, N. Mex. Grading in progress by the W. R. Stubbs Contracting Co. (Mar. 11, 1904.)

——Extension from Searcy, Ark., the terminus of the Searcy branch, to Aubur, 42 miles. Projected. (Mar. 11, 1904.)

CINCINNATI & MILFORD TRACTION.—This road, which now extends from Madisonville, Ohio, to Milford, 10 miles, is to be extended northeast to Blanchester, 30 miles.

CINCINNATI, BLUFFTON & CHICAGO.—This road is in operation from Bluffton, Ind., to Portland, 30 miles, and is to be extended this year from Bluffton to Huntington. The road is at present in the hands of a receiver, and all construction stopped. A. T. Russell, Bluffton, Ind., is Chief Engineer.

*CINCINNATI, GEORGETOWN & PORTHMOUTH.—Contract reported let to Thomas Denton, of West Union, Ohio, for building an extension from Russellville, Ohio, east to Eckmansville, six miles.

——Branch from Bethel, on the main line, south to Felicity, nine miles. Proposed.

CINCINNATI, HAMILTON & DAYTON.—Branch line from Dayton, Ohio, west to Richmond, Ind., 40 miles. Surveys in progress. Connection to be made with the Chicago, Cincinnati & Louisville at a point a few miles south of Richmond.

*CINCINNATI, NEW ORLEANS & TEXAS PACIFIC.—Work in progress on a branch from Cardiff, Tenn., to Hoods Landing, on the Tennessee River, five miles. Bolt, Koon & Borches, Knoxville, Tenn., are the contractors.

CINCINNATI RAPID TRANSIT (Electric).—Incorporated in Ohio, to build an electric railroad for freight and passenger service from Cincinnati northeast via Norwood to Dayton. Work will be begun between Cincinnati and Norwood, 3 miles, at once. C. H. Rowe, H. H. Hoffman, M. E. Ingalls and M. I. Freiberg, Cincinnati, are incorporators. (Mar. 11, 1904.)

CINCINNATI SUBURBAN BELT.—Incorporated to build from a point near Red Bank, Ohio, through Oakley, Norwood, Bond Hill, St. Bernard and Winton Place to Cumminsville, 10 miles. J. M. Wilson, H. E. Langdon and J. E. Blaire, Cincinnati, Ohio, are incorporators. (Mar. 11, 1904.)

CINCINNATI, TOLEDO & COLUMBUS TRACTION.—This road is projected from Toledo, Ohio, southwest to Lima, 70 miles, paralleling the Cincinnati, Hamilton & Dayton, thence south and east via Roundhead and Indian Creek to Bellefontaine, Marysville and Columbus.

CLARKSDALE, LYON & FRIARS POINT.—Proposed line from Clarksdale, Tenn., to Friars Point, 14 miles. J. F. Hunter, Manager of the Tennessee Trust Co., Memphis, Tenn., is interested.

CLEVELAND, CINCINNATI, CHICAGO & ST. LOUIS.—Reconstruction of the Michigan Division between Benton Harbor, Mich., and Indianapolis, Ind. Proposed.

——New yard at Mitchell, Ill., a few miles south of Alton, to contain about 44 miles of track. Proposed.

CLEVELAND, WOOSTER, MOUNT VERNON & COLUMBUS (Electric).—Incorporated in Ohio to build from Wooster, Ohio, through Wayne, Holmes, Ashland, Richland, Knox, Licking and Franklin counties to Columbus, 105 miles, with a branch to Mansfield, Ohio, 12 miles.

CLEVELAND, YOUNGSTOWN & OHIO.—Proposed line in Ohio from Cleveland through Cuyahoga, Summit, Portage, Trumbull and Mahoning counties, southeast to Lowellville, 65 miles. Thomas E. Connell and F. B. Hamilton are incorporators.

CLEVELAND, YOUNGSTOWN & EASTERN.—Projected road from Moran, Ohio, 20 miles from Cleveland, on the Wheeling & Lake Erie, to Youngstown, 40 miles, and thence to a connection with the Buffalo, Rochester & Pittsburg near Newcastle, Pa.

*COAL & COKE.—Uncompleted section from Sago, W. Va., through Burnsville to Gassaway, 58 miles, under contract to McArthur Bros., of Chicago; Furgurson Contracting Co., of Pittsburg, and Joe Fucco, of Weston, W. Va. There will be 5,800 ft. tunnels and 30 steel bridges on the entire line, which will be 173 miles long, from Elkins to Charleston, when this section is completed. A. A. Chapman, Weston, W. Va., is Chief Engineer.

——*Contract reported let to the Smith Construction Co., of Philadelphia, for grading a nine-mile extension from Frenchton, Upshur County.

COAL RIVER RAILROAD.—Chartered to build from Point Pleasant, W. Va., southeast to St. Albans and Coal River, 42 miles, and thence southeast to Bramwell, 84 miles. M. D. MacCorkle, W. M. Williamson and Samuel Stephenson, of Charleston, W. Va., are incorporators.

COAST RAILROAD (Electric).—Projected line from Henderson's Point, Miss., on the Bay of St. Louis, via Gulfport, to Biloxi, 26 miles, paralleling the Louisville & Nashville. Line located and grading to be begun shortly. Estimated cost of construction and equipment, $332,000. W. K. Penney, Gulfport, Miss., is said to be interested.

COEUR D'ALENE & SPOKANE.—This company, which operates a road between Cœur d'Alene and Spokane, 33 miles, is making surveys for an extension to Liberty Lake.

COLORADO & SOUTHERN.—Preliminary surveys reported finished for a branch line from Belleville, Colo., to quarries near Owl Canyon, 18 miles northwest of Fort Collins.

——See Denver & Interurban.

COLORADO, COLUMBUS & MEXICO.—Incorporated in New Mexico to build from Salt Lake City, Utah, south through Marysvale, on the Rio Grande Western, to El Paso, Tex., with a later extension from El Paso to Monterey, Mex. A. O. Bailey, of Columbus, N. Mex., and J. G. Hilzinger, of El Paso, are incorporators.

COLORADO, NEW MEXICO & GULF (SANTA FE CENTRAL).—Incorporated in Colorado to build in Colorado and New Mexico. W. S. Hopkins, of Hillsboro, N. Mex., is named as an incorporator.

COLORADO, OKLAHOMA & SOUTHEASTERN.—The proposed route of this road is from Weatherford, Okla. T., through Independence, Putnam, Lenora, Mutual, Hackberry and Detroit to Woodward, 90 miles, with a branch line from Hackberry to Gage, Okla. T., 35 miles. Location surveys completed and contracts for grading will shortly be let. The maximum grade is 0.8 per cent. P. A. McCarthy, Weatherford, Okla. T., is Chief Engineer.

COLORADO ROADS.—Franchise granted for an electric line 100 miles long through Delta County, Colo. W. B. Stockham and C. L. Pike, of Delta, are interested.

——Reported that the Great Western Coal Co., of Florence, Colo., will build a road from its coal lands in Fremont County to Colorado Springs, 50 miles. F. D. Keith, of Canyon City, is interested.

*COLORADO, TEXAS & MEXICO.—Grading reported in progress at Abilene, Tex., on this proposed road, from Washburn, Tex., in the Panhandle, to San Antonio, 400 miles. Surveys finished and rights of way secured for the most of the line. At Washburn the road will connect with the Southern Kansas, the Fort Worth & Denver City and the Rock Island, and at Abilene with the Texas & Pacific. The Rock Island is said to be back of the project.

COLORADO, WYOMING & IDAHO.—Incorporated in Wyoming to build from Denver, Colo., northwest to Laramie, Wyo., 90 miles. Surveys reported finished and construction to be begun this spring. W. R. West, Laramie, Wyo., and John D. Milliken, McPherson, Kan., are said to be interested.

COLUMBIA & LEBANON.—Incorporated in Kentucky, with a capital stock of $1,000,000. The road will have a total length of 46 miles, but the proposed route is not stated.

COLUMBIA & NORTHWESTERN.—Chartered in Arkansas to build from Old Lumber, between Waldo and Buckner, in Columbia County, south to Macedonia, 18 miles. J. J. Cochran, G. W. McKay and J. S. Jones are interested.

*COLUMBIA RIVER & OREGON CENTRAL.—Contract let to the Pacific Coast Construction Co., of Portland, Ore., for building this road from Arlington south to Condon, 45 miles. Branch lines are eventually to be built from Ione southwest to Condon, 25 miles, and from Arlington west to Rock Creek, 10 miles. W. H. Kennedy, Portland, Ore., is Chief Engineer.

COLUMBUS, MARSHALL & NORTHEASTERN.—Work is to be resumed on this proposed road from Marshall, Mich., to Olivet, 40 miles. Grading was completed between these two points in 1902, but the work was stopped owing to lack of funds. H. E. Hollon, Marshall, Mich., is President.

COLUMBUS, MEMPHIS & PENSACOLA.—Proposed line from Aberdeen, Miss., via Columbus, Miss., and Demopolis, Ala., to Pensacola, Fla., 275 miles. Newman Cayce, Aberdeen, Miss., is President.

*COLUMBUS, URBANA & WESTERN (Electric).—New electric line, successor to the Urbana, Mechanicsburg & Columbus, from Urbana, Ohio, east, via Mechanicsburg, Plain City and Dublin, to Columbus, 48 miles. Under construction. Seven miles in operation. W. A. Ginn is Chief Engineer.

CONSOLIDATED RAILWAY (Electric) (N. Y., N. H. & H.).—Application has been made to the legislature for permission to build a new trolley line between Wallingford, Conn., and Meriden.

——*Work has been begun on extending the Fairhaven & Westville branch from Fairhaven to Wallingford, Conn. This link will give the Consolidated Railway an electric line between New Haven and Wallingford.

——This company will build an electric road from Central Village, Conn., through the towns of Lisbon, Jewett City and Versailles, where it will connect with the Norwich road, thus supplying the connecting link for a continuous electric line between Worcester, Mass., and New London, 60 miles.

*CONSOLIDATED TRACTION (INDIANA).—New line from Indianapolis to Crawfordsville, 45 miles. Work in progress.

CORNING, KEUKA LAKE & ONTARIO.—Incorporated to build from Corning, N. Y., north to Sodus Bay on Lake Ontario, 96 miles. This is a revival of the Sodus Bay, Corning & New York, organized long ago, but killed by litigation which lasted more than 30 years. Thirty-five miles of the roadbed was graded by the former company. The new company is capitlized at $1,500,000. Contracts will be let soon for building from Savonia, on the Erie, north through Sonora, Bradford and Wayne to Penn Yan, on the New York Central. R. H. Curtis, Bradford, N. Y., is President.

*CONWAY, COAST & WESTERN.—The proposed route of this road is from Sumter, S. C., east to Conway, 75 miles, with a branch line from Britton's Neck north to Marion, about 20 miles. It is the intention of the company eventually to extend the line from Conway east to Southport, 50 miles. Surveys have been finished from Conway west to Cool Springs, 12 miles, and grading on this portion of the line is in progress. Location surveys are also in progress from Cool Springs to Britton's Neck, 4 miles. Connection will be made with the Atlantic Coast Line and the Southern at Sumter, and with the Atlantic Coast Line and Carolina Northern at Marion. F. A. Burrows, Conway, S. C., is President, and R. E. Beatty, Chief Engineer.

COTTON BELT & NORTHERN.—An extension of its charter has been granted this company to build from Onalaska, in Ouachita County, Ark., southeast to Locust Bayou, in Calhoun County, 15 miles. In operation to Pritchard, three miles.

COUNCIL BLUFFS, TABOR & SOUTHERN (Electric).—A franchise has been granted this company to build an electric railroad from Council Bluffs, Ia., through Glenwood, Tabor, Sidney, Riverton and Lockport to Tarkio, Mo., 84 miles. Rights of way are now being secured. W. J. Dobbs, Council Bluffs, is President.

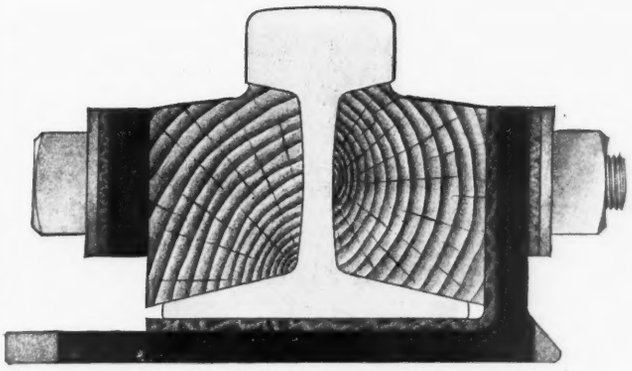
*COUNCIL CITY & SOLOMON RIVER.—New line from Dickson (Solomon), Alaska, to Council City, 50 miles. About 13 miles have been completed to East Fork. The Western Alaska Construction Co., 81 Fulton St., New York, is building the road.

CRAWFORD COUNTY MIDLAND.—Chartered in Missouri to build a railroad six miles long in Crawford County from a point on the St. Louis & San Francisco, near Steelville. W. K. Bixby and H. J. Hannibal are incorporators.

CRYSTAL RIVER.—Incorporation has been granted this company in Florida to build from Crystal, in Citrus County, northeast to Dunnellon, 15 miles. W. N. Camp is President and R. C. Camp, General Manager, both of Ocala, Fla.

THE WEBER RAILWAY JOINT MFG. CO.

EMPIRE BUILDING, NEW YORK.



INSULATED JOINT FOR TRACK CIRCUITS.

—BRANCH OFFICES—

BOSTON, 70 Kilby Street

CHICAGO, Old Colony Building

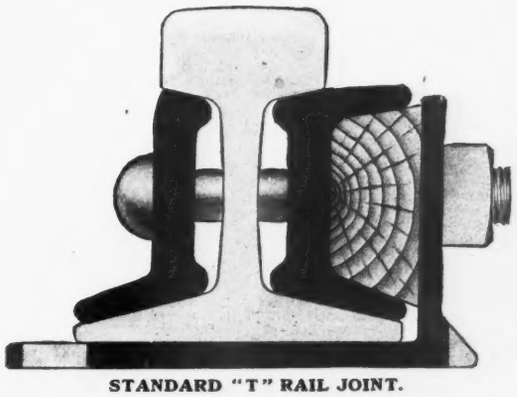
ST. LOUIS, 622 Frisco Building

OMAHA, 1212 Farnam Street

DENVER, 233 Majestic Building

—MANUFACTURERS OF—

Standard Girder Insulated Step JOINTS



STANDARD "T" RAIL JOINT.

All the articles manufactured by this company are thoroughly protected under numerous United States and foreign patents

CUBAN ROADS.—Reported that the board of directors of the Cardenas & Jucaro have completed plans for building an extension from the present southern terminus at Yaguaramas to Cienfuegos. Work will be begun soon. (Mar. 11, 1904.)

CUMBERLAND & MOUNT SAVAGE (Electric).—New company in Maryland to build an electric railroad from Cumberland to Mount Savage, with branch lines from Corrigansville to Ellesile and from Barrowville to the Pennsylvania State line, a total distance of about 20 miles. G. C. Uhl, Mount Savage, and W. O. McLean, Frostburg, are named as incorporators.

*CUMBERLAND RAILROAD.—This company, which proposes to build a line from Artemus, Ky., on the Louisville & Nashville, south to Lunsford, 10 miles, has let the contract for the first 7½ miles of the line to Eddington, Griffiths & Co., of Knoxville, Tenn. A bridge will have to be built over the Cumberland River. C. W. Stone, of Warren, Pa., is President.

CUMBERLAND VALLEY.—Reported that this company will double track its road from Martinsburg, W. Va., to Shippensburg, 53 miles. The work will be done by the company's forces.

D

DALLAS & EASTERN TEXAS TRACTION.—Incorporated in Texas to build an electric railroad from Dallas east through Mesquite, Forney, Terrell and Elmo to Willspoint, 40 miles. T. L. Marsalis, Dallas, Tex., and R. S. Kimbrough, Mesquite, Tex., are incorporators.

DALLAS & ROSWELL.—Work is soon to be begun on this proposed railroad from Dallas, Tex., to Roswell, N. Mex., 500 miles. E. P. Spears, Dallas, Tex., is President.

DALLAS, CLEBURNE & SOUTHWESTERN.—Extension projected from Cleburne, Tex., southwest to Dallas. The road runs at present between Egan and Cleburne, 10 miles. B. F. McDonald, Fort Scott, Kan., is President, and W. D. Meyers, of Cleburne, Tex., General Manager.

DALTON & ALACULSY.—Money reported provided for completing this road from Dalton, Ga., to Crandall, in Murray County, 20 miles. Grading completed but work suspended for lack of funds. Connection will be made with the Southern and the Western & Atlantic at Dalton. M. S. Squires, Dalton, Ga., is interested.

DALTON STREET.—Chartered in Pennsylvania to build an electric line from Providence Corners through Factoryville, Clarks Summit, Glenburn, Dalton and La Plume. Rights of way are secured and contracts for grading will shortly be let. A. L. Nesbitt is President, and J. M. Boland, Treasurer. (Mar. 11, 1904.)

DANVILLE & NORTHERN.—Incorporated in Illinois to build from a point in Vermilion County through Iroquois and Kankakee counties to a point on the north line of Will County. L. E. Fisher, G. L. Buckingham and Robert Parks, of Danville, are incorporators.

*DAVENPORT & SUBURBAN.—Contract for grading this new road from Davenport, Iowa, to Muscatine, 44 miles, has been let to the International Construction Co. Work has been begun. (Mar. 11, 1904.)

DAWSON, DALHART & OKLAHOMA CITY.—Organized to build from Dawson, N. Mex., to Dalhart, Tex., 100 miles, passing through Colfax and Union counties in New Mexico, and Dallam, Sherman, Houston and Ochiltree counties in Texas. Surveys in progress. J. H. Conlen, W. W. Leeman, D. C. Diltz and others, of Dalhart, Tex., are incorporators. (Mar. 11, 1904.)

DAYTON, LEBANON & CINCINNATI.—Projected branch from Lebanon, Ohio, to Cincinnati, 26 miles. (Mar. 11, 1904.)

DECATUR, TUSCOLA & CHAMPAIGN.—New line in Illinois, from Decatur to Tuscola, 35 miles, paralleling the Indiana, Decatur & Western between these two points. Projected. W. H. Black, D. L. Campbell, J. L. Ray, A. W. Wallace and others, of Decatur, Ill., are incorporators. (Mar. 11, 1904.)

*DEEPWATER RAILROAD.—This company is building a road from Deepwater, W. Va., to the Virginia State line, about 110 miles. Contracts have been let from Deepwater to Bluestone River, 85 miles, to Martin & Martin, McFarland & Co., W. O. Lipscond & Co., P. A. Langhorn & Co., Mason, Hoge & Co., the Carl Construction Co. and Rossi, Garland, Sitz & Co. Grading has been completed from Deepwater to Guyandotte River, 60 miles, and track laid as far as Core Hollow, 15 miles. Additional contracts will soon be let. William N. Page, Ansted, W. Va., is Chief Engineer.

——See Tidewater Railroad.

DEERING & SOUTHWESTERN.—Incorporated in Missouri to build a line 10 miles long in Dunklin and Pemiscot counties. W. W. Proper and James Graham, of Deering, Mo., are incorporators. (Mar. 11, 1904.)

DE KALB & SOUTHEASTERN.—Incorporated in Illinois to build a terminal connecting railroad in and about De Kalb. A. W. Fisk, E. E. Watson and others, of De Kalb, Ill., are incorporators.

DELAWARE & EASTERN.—Incorporated in New York to build a steam railroad from East Branch, N. Y., to Arkville, with a branch line to Andes, a total distance of about 45 miles. Connection will be made with the Ulster & Delaware at Arkville and with the New York, Ontario & Western at East Branch. Among the directors are: Edward Kelly, of Wharton, N. J.; J. W. Learing, Dover, N. J.; H. A. V. Post, Russell Murray and G. A. Lee, of New York.

*DELAWARE & HUDSON.—Contract let to P. Hart & Sons, of New Brighton, Staten Island, New York, for building a branch from Thurman, N. Y., on the North Creek branch of the Adirondack Division, east to Warrensburg, three miles. Work to be completed by July 1.

——Surveys reported to have been begun for a line from Mechanicsville, N. Y., southeast across Rensselaer and the northeast corner of Columbia counties, 40 miles, to State Line, Berkshire County, Mass., the terminus of a branch of the New York, New Haven & Hartford.

——Reported that this company will build a branch from Granville, N. Y., to the southeast of Lake St. Catherine in Vermont. No surveys have as yet been made.

——Nothing definite as yet decided about equipping this company's line with the third-rail electric system between Carbondale and Wilkesbarre, Pa. The question of the electrification of the Pennsylvania division has been given serious consideration, and several additional tracks will probably be built in the near future in that territory.

——Projected branch from Tekene Junction, N. Y., east to a connection with the Chateaugay R. R., 6 miles. (Mar. 11, 1904.)

——Reported that this company will build a spur of its road, which will be operated by electricity, through Water Street, Albany, and along the Hudson River front through the lumber yards district.

DELAWARE & LACKAWANNA TUNNEL RAILROAD.—Incorporated in New York in the interest of the Delaware, Lackawanna & Western to build and operate a tunnel under the Hudson River from Hoboken, N. J., to Manhattan, New York. The incorporators include: W. H. Truesdale, E. E. Loomis, and others, all of New York.

*DELAWARE, LACKAWANNA & WESTERN.—Plans approved by the city officials of Newark, N. J., for abolishing the Clifton avenue grade grossing and for depressing the railroad tracks at that point. The company will begin the depression of its tracks at High Street, and will eliminate all grade crossings through Newark. Work now in progress.

——Plans completed for elevation of tracks through Orange, N. J. The estimated cost of the work is $1,000,000. The city will be asked to pay part of this amount. All grade crossings will be abandoned and a new station built.

——*Depression of tracks at Summit, N. J., from a point half a mile east of the station to the city limits, about two miles. Estimated cost, $525,000. Contract made with city. Work in progress and to be completed in September.

——This company is reported to be considering an extension of its Cincinnatus branch (formerly the Erie & Central New York) from Cincinnatus east to South Otselic, 20 miles. The Erie & Central New York runs between Cortland and Cincinnatus, 19 miles. It was purchased by the D., L. & W. in December, 1903.

——Permission asked to elevate tracks and build a bridge over the Ohio Basin slip, in Buffalo, N. Y. (Mar. 11, 1904.)

DEL NORTE & HUMBOLDT.—Incorporated in California, to build from Eureka north to Crescent City, approximately 100 miles. Five branches will also be built—one eight miles long, up Humboldt Creek; one up the Klamath River, 10 miles; one up Little River, eight miles; one along Redwood Creek, 12 miles, and one from Arcata up Mad River, 15 miles. Hiram C.

Smith, San Francisco, is interested. (Mar. 11, 1904.)

DELRAY CONNECTING.—Incorporated in Michigan to build a road two miles long in Ecorse and Springwells to townships in Wayne County connecting the Detroit Union Depot Co.'s tracks with the Pere Marquette, the Wabash, the Michigan Central and the Detroit Southern railroads. R. E. Clapp, C. E. Herbert, E. H. Bingham and others are incorporators.

*DELTA SOUTHERN.—The proposed route of this road is from Elizabeth, Miss., in a northerly direction to Kuhns, 25 miles, with a branch line from Elizabeth south to Campbellsville, in Yazoo County, 20 miles. Grading is now in progress on the first 11 miles out of Elizabeth towards Kuhns. The contractors are Jones & Brewer, of Birmingham, Ala. The work is light, with a maximum grade of 0.8 per cent. W. H. Wells is the engineer in charge of the work, and J. S. B. Thompson, Atlanta, Ga., is President.

DENVER & BOULDER INTERURBAN.—Incorporated in Colorado to build an electric railroad from Denver northwest to Boulder, 25 miles. S. B. Toney, J. R. McKinnie and others, of Denver, Colo., are incorporators.

*DENVER & GREAT WESTERN.—Contract reported let to J. A. Osurr for building a six-mile extension of this road, now eight miles long, connecting the sugar factories of Fort Collins, Winsor, Longmont and Lovell, Colo. Further extensions projected.

DENVER & INTERMOUNTAIN.—Incorporated in Colorado as successor to the Denver, Lakewood & Golden, which was sold under foreclosure proceedings last May. The road of the D., L. & G. runs from Denver to Golden, 13 miles, with branch lines to Barnum and Ralston, 11 miles. It is proposed to build an extension from Johnson's, two miles east of Golden, in a westerly direction through Mt. Vernon and Vernon Summit to the western boundary line of Jefferson County and thence in a northwesterly direction through Idaho Springs to Georgetown. It is also proposed to build a line through Boulder, Loveland, Longmont and Fort Collins. H. K. Brown, C. H. Parsons, F. W. Loveland and others, of Denver, Colo., are interested.

DENVER & INTERURBAN.—Incorporated in Colorado for the purpose of electrifying certain portions of the Colorado & Southern in the vicinity of Denver, including the line from Denver to Boulder, 30 miles; the line from Denver to Idaho Springs, 37 miles, and the Lafayette branch. Authorized capital, $3,000,000. A. D. Parker, J. M. Herbert and G. M. Dodge are incorporators.

DENVER & KANSAS NORTHERN.—Incorporated in Kansas, with headquarters at Beloit, to build six lines in Northwestern Kansas, the estimated aggregate length of which will be 1,400 miles. Grading to be begun in August from Stockton, the terminus of a branch of the Missouri Pacific, southwest via Hill City to Scott, on the Missouri Pacific, 125 miles. The directors are: J. P. Pomeroy, Colorado Springs; E. J. Williams, Stockton; A. T. Rodgers and F. T. Burnham, Beloit; W. W. Caldwell, Concordia, and J. S. Parks and J. R. Mulvane, Topeka.

*DENVER & RIO GRANDE.—Construction work was commenced on February 2 on a standard-gage branch from Durango, Colo., south to Farmington, N. Mex., about 52 miles. Line is to run south for 20 miles through Las Animas canyon, thence southwesterly through the open valley of Las Animas to Farmington, at the junction of the San Juan and Las Animas rivers. Five bridges will be built in the canyon. Total cost of construction estimated at $1,000,000. Kilpatrick Bros., of Beatrice, Neb., are the contractors.

——*Contract let to Bell & Levy, Pueblo, Colo., for building a seven-mile extension from the Loma branch northwest to coal fields near Walsenburg. Surveys completed and grading to be begun at once.

——Amendment to charter filed in Colorado for the purpose of building two branches, one from Howard, Fremont County, Col., to the southwestern portion of the county, and the other from Sargents, Saguache County, north to Tomichi, Gunnison County. Reported that preliminary work on these branches has begun.

——Proposed branch line from Delta, Colo., to the source of the North Fork of the Gunnison River. (Mar. 11, 1904.)

——Proposed extension from Heber, Utah, on the Rio Grande Western, through Duchesne County and Daniels Pass. (Mar. 11, 1904.)

——Cut-off in Utah from Salina, on the Sevier branch of the Rio Grande Western east to Green River, on the main line west of Grand River, 115 miles. Thirty miles out of Salina have been completed, and surveys have been made for the entire distance. The Utah Construction Co. are the contractors. (Mar. 11, 1904.)

——Extension of Sevier branch of the Rio Grande Western authorized from Marysvale, Utah, south through Circleville, passing up the South Fork Canyon, to Parowan Valley. Surveys for this line have been finished. (Mar. 11, 1904.)

*DENVER, ENID & GULF.—Work under way on an extension from Enid, Okla. T., northwest to Kiowa, Kan., 100 miles. In operation to Coldwater, 20 miles. The proposed route extends to Hays, Kan., 170 miles.

——This company is making surveys for an extension from Guthrie, Okla. T., southeast to Texarkana, Ark., 215 miles.

*DENVER, NORTHWESTERN & PACIFIC.—This company has completed its line as far as Arrowhead, Colo., 73 miles from Utah Junction. Work is now in progress on a further extension to Hot Sulphur Springs, 35 miles. The contractors are Orman & Crook, of Pueblo, Colo. The line has been surveyed from Hot Sulphur Springs via Kremmling, Steamboat Springs, Hayden, Craig, Maybell, Vernal and Provo to Salt Lake, Utah, 428 miles. H. A. Sumner, Denver, Colo., is Chief Engineer.

——The Northwestern Terminal Railroad, with an authorized capital of $2,500,000, has been organized by this company to build a terminal railroad in Denver for the D., N. W. & P. Besides the actual right-of-way into the city sufficient ground will be acquired for building passenger and freight stations, yards and for general terminal facilities.

——This company, it is said, will build a two-mile tunnel, to cost about $2,000,000, through the continental divide near James Peak, Colo.

DENVER, WICHITA & MEMPHIS.—Chartered in Oklahoma Territory to build from Denver east through Colorado, Kansas, Oklahoma and Indian territories to Memphis, Tenn., about 2,000 miles. The headquarters of the company will be at Oklahoma City. F. W. Casner and M. Harrington, Kansas City, Mo., are among the incorporators.

DENVER, WOODWARD & SOUTHEASTERN.—Chartered in Oklahoma. The proposed route is from Denver southeast through Oklahoma and Indian Territories to Texarkana, Ark., approximately 1,000 miles. E. S. Wiggins, Woodward, Okla. T., is President: C. E. Sharp, Vice-President; E. B. Collins, Secretary, and J. W. Magee, Treasurer.

DEPUE & NORTHERN.—Incorporated in Illinois to build from Depue northeast to Seatonville, Bureau County, six miles. William B. McIlvaine, Lakeside, Ill., and Houston C. Adcock, Western Springs, Ill., are interested.

DES MOINES & ELDORA (Electric).—Proposed electric line from Des Moines, Iowa, northwest to Eldora, 65 miles. Surveys under way. Part of this survey was made some time ago by the Des Moines City Railway, over whose line the new company will enter the city of Des Moines. Judge Porter, of Eldora, is interested.

*DES MOINES & SOUTHERN.—Contract let to Winston Bros. for grading an extension from Winterset southwest to Greenfield, Iowa, 40 miles. Rights of way have been practically all secured, and work has been begun. F. W. Cherry, Des Moines, Iowa, is interested. (Mar. 11, 1904.)

DES MOINES INTERURBAN.—New line from Des Moines through Grimes to Adel, 20 miles. The company has purchased 50 acres of land in Des Moines for freight terminals. H. H. Polk is President.

DES MOINES, IOWA FALLS & NORTHERN.—Extension from Iowa Falls in a northerly direction, about 110 miles, on which work is to be begun this spring. The route is not yet determined. Charles City and Mason City are both being considered for the terminus of this extension. E. E. Ellsworth, Iowa Falls, President.

DES MOINES WESTERN.—Reported that this company will shortly begin work on a belt line around the city which will connect with all the brick and coal industries about the city of Des Moines. Surveys in progress.

DETROIT-BAY CITY TRACTION.—Incorporated to build an electric railroad from Detroit through Pontiac, Mayville and other points to Bay City, 108 miles. L. E. Farnum, J. H. Christian, C. V. Dard and others, of Detroit, Mich., are interested.

DETROIT BELT LINE.—Plans reported under way and surveys in progress for building a new belt line in and about Detroit, about 25 miles long. P. N. Jacobson, Detroit, Mich., may be addressed.

DONALDSONVILLE & NAPOLEONVILLE.—Location surveys have been completed for building from Johnson, La., to Houma, 40 miles; and from Thibodaux to Gibson, 16 miles. M. D. Bringier, Donaldsonville, La., is General Manager.

*DIAMOND & CALDER.—New line from Diamond, Cal., two miles southwest of Placerville, to Calder, 33½ miles. Grading in progress. The road is being built by the California Sash & Door Co. (Mar. 11, 1904.)

DOMINION & GULF—See Kansas Central, Oklahoma & Gulf.

DOUGLAS, AUGUSTA & GULF.—This road, formerly the Wadley & Mt. Vernon Extension, is now in operation from Nashville, Ga., northeast to Barrows Bluff. An extension is planned from Barrows Bluff north via McRae and Helena to Rockledge, on the Wadley & Mt. Vernon, which runs from Rockledge northeast to Wadley, 40 miles.

DOVER & SOUTH BOUND.—Extension of charter granted in North Carolina by which this road, owned by the Goldsboro Lumber Co., and running from Dover to Richlands, 25 miles, may be extended to Swansboro, 30 miles. The company plans to build this extension with its own forces.

DUBLIN & SOUTHWESTERN.—Extension projected from Eastman, Ga., south to Fitzgerald, 35 miles. The present line extends from Dublin southwest to Eastman, 31 miles. E. P. Rentz, Dublin, Ga., is President.

*DULUTH, MISSABE & NORTHERN.—Contract let to Winston Bros., of Minneapolis, for building an eight-mile cut-off from a point on the main line near Shaw, Minn., to Scott. The new line will avoid the heavy grades in the vicinity of Hibbing.

*DULUTH, ST. CLOUD, GLENCOE & MANKATO.—Contract let to E. L. Tobie & Co., of New York and of Albert Lea, Minn., who have given a bond for $50,000 for its fulfillment, for building this road from Albert Lea north to Mankato, 52¼ miles. Locating surveys are to be begun this month and grading on or before May 1. A. H. Reed, of Glencoe, Minn., is President, and W. W. Olney, Chief Engineer.

*DULUTH, VIRGINIA & RAINY LAKE.—Extension from Virginia to Koochiching, Minn., 100 miles. Contract let to the Minnesota Land & Construction Co., Duluth, of which Wirt H. Cook is President. In operation to Ashawa, 27 miles.

DURANGO, ALBUQUERQUE & GULF (SANTA FE CENTRAL).—Incorporated in New Mexico to build from San Felipe through Bernalillo, McKinley and San Juan counties, New Mexico, to a point in La Plata County, Colo., 220 miles. W. H. Andrews and W. S. Hopewell, both of Santa Fe, N. M., are said to be interested.

*DURHAM & CHARLOTTE.—Extension from Pittsboro, N. C., northwest to Greensboro, 48 miles. Work in progress. J. L. Tull, Pittsboro, N. C., is Chief Engineer. (Mar. 11, 1904.)

DURHAM & SOUTHERN.—Chartered to build from Durham, N. C., south to Apex, 25 miles. Surveys in progress. Connection will be made with the Cape Fear & Northern at Apex. B. N. Duke is President. (Mar. 11, 1904.)

DYERSVILLE & NORTHERN.—Incorporated in Iowa to build from Dyersville to New Vienna, five miles, and, later, extensions to various points. The incorporators are: Jacob Herper, G. H. Hessleman, E. C. Peaslee, and others, of Dubuque, Iowa.

DYERSBURG NORTHERN.—Incorporated in Tennessee to build from Dyersburg north to Tiptonville, in Lake County, 30 miles. Connection will be made with the Illinois Central at Dyersburg. George T. Weakley, J. C. Doyle and W. H. Kupe, all of Dyersburg, Tenn., are incorporators.

E

EAGLE VALLEY.—Incorporated in Oregon to build from Baker City east to Richland, in Baker County, 50 miles. W. L. Vinson, John Waterman and P. Basche, all of Baker City, Ore., are named as incorporators.

EASTERN IOWA (Electric).—Surveys reported to be finished for this proposed electric railroad from West Liberty, through Iowa City to Muscatine. A. F. Groeltz, Cedar Rapids, is President, and W. W. Chamberlain, Secretary.

EASTERN NEW YORK (Electric).—Reorganization of the Ballston Terminal, sold under foreclosure December 29, 1904. Carries both freight and passengers. Extension projected to Amsterdam, Johnstown and Gloversville; also from Ballston to Middle Grove, in Saratoga, 14 miles. A. R. Law is President.

EASTERN OREGON.—Proposed line from Arlington, Ore., to Condon, 46 miles. W. C. Morris, Arlington, is interested. (Mar. 11, 1904.)

EASTERN RAILWAY & LUMBER.—This company has acquired the rights and franchises of the Tacoma, Olympia & Chehalis Valley, and proposes to build from Centralia, Wash., east to timber lands. A. B. Woods is Chief Engineer, and F. H. Hubbard, President, both of Tacoma, Wash. (Mar. 11, 1904.)

EASTERN TEXAS.—Proposed extension from Kennard, Tex., to Crockett, where connection can be made with the International & Great Northern, 30 miles. Surveyed two years ago. J. A. Sargent, Kansas City, Mo., is President.

EASTERN WASHINGTON. — Incorporated in Washington to build from Fletcher to Connell, 35 miles. E. W. Swanson, Spokane, Wash., and W. S. Foster, Cheney, Wash., are interested. Surveys completed and grading to be begun early this spring.

EAST ST. LOUIS & COLUMBIA.—Incorporated in Missouri, to build from East St. Louis, Ill., via Waterloo to Columbia, Mo., 100 miles. T. N. Chase, P. J. Meyers and others, of East St. Louis, are interested. (Mar. 11, 1904.)

EAST ST. LOUIS TERMINAL.—Incorporated at East St. Louis, Ill., to build from Harrisonville to Alton, 65 miles. Surveys made. M. M. Stevens, W. S. Forman, Robert Bethmann, and others, of East St. Louis, are directors.

EAST ST. LOUIS, WATERLOO & CHESTER.—Incorporated in Illinois to build from East St. Louis through St. Clair, Monroe and Randolph counties to Waterloo and Chester, 50 miles. Thomas M. Chase and Tyron J. Woodward, of St. Louis, and Edward F. Schoening, of Columbia, Ill., are incorporators.

EAST TENNESSEE.—Charter granted this company in Tennessee to build from Chattanooga to Oliver Springs, 75 miles, with a branch line to Harriman. J. M. Abel, J. S. Legg, E. B. Henry and others, of Chattanooga, are incorporators.

EAST TENNESSEE & WESTERN NORTH CAROLINA.—It is officially announced that work will be begun at once preparatory to changing this road from narrow to standard gage. The line extends from Johnson City, Tenn., to Cranberry, N. C., 34 miles. G. W. Hardin, Johnson City, Tenn., is General Superintendent.

EGYPTIAN COAL RAILROAD.—Organized at Carbondale, Ill., to build a railroad from the Mississippi River northeast through the counties of Jackson, Williamson, Franklin and Jefferson to Mount Vernon, Ill., about 50 miles, where connection will be made with the Louisville & Nashville, the Wabash, Chester & Western, and Chicago & Eastern Illinois. C. E. Hamilton, R. E. Refrow, J. B. Bundy, E. S. Patten and others are incorporators.

ELIZABETH CITY & CAROLINA.—Chartered to build from Wilmington, N. C., to Elizabeth City, 150 miles. R. G. Grady and S. P. McNair, of Wilmington, are interested. (Mar. 11, 1904.)

ELKTON & BEAVER VALLEY.—Incorporated in Kentucky to build 60 miles of railroad through Floyd and Boyd counties.

ELLICOTTVILLE, MANSFIELD & EAST OTTO.—Incorporated in New York to build from Ellicottville via Mansfield to East Otto, 15 miles. D. S. Laing and F. H. Holmes, of East Otto, are directors. (Mar. 11, 1904.)

ELMGROVE, EASTERN & MAJORSVILLE.—Organized in West Virginia to build a railroad from Elmgrove southeast to Majorsville, 10 miles. G. W. Hand, Elmgrove, W. Va., may be addressed.

ELMIRA & CORNING SHORT LINE (Electric).—Incorporated in New York to build an electric railroad from Elmira to Corning, 13 miles. J. H. Caldwell, W. F. Hurley, Troy; W. J. Tully, Corning; L. S. Manley, Elmira, N. Y., and others are incorporators.

FROGS CROSSINGS

CLEVELAND FROG & CROSSING CO.

MANUFACTURERS OF

HARD SERVICE TRACK WORK

CLEVELAND, OHIO

SWITCHES SWITCH STANDS

ALABAMA FROG & SWITCH COMPANY

ANNISTON, ALA.

Manufacturers of

RAILROAD CROSSINGS
FROGS and SWITCHES

and Special Work of Every Description for Steam and Street Railways

THE INDIANAPOLIS SWITCH & FROG CO.

MANUFACTURERS OF

"HIGH GRADE"

FROGS, CROSSINGS, SWITCHES, SWITCH STANDS, RAIL BRACES AND GENERAL TRACK SUPPLIES

FOR STEAM and ELECTRIC RAILWAYS. ALSO MINE and INDUSTRIAL TRACKS.

SPRINGFIELD, OHIO, U. S. A.

EL PASO & DURANGO.—Incorporated in New Mexico to build from Mastodon, in Donna Ana County, on the El Paso & Southwestern, north across the territory of New Mexico to La Plata, San Juan County, N. Mex., and a branch from Putnam, San Juan County, 120 miles southeast to Albuquerque. The main line will be about 400 miles long. The incorporators are said to represent the Phelps-Dodge interests and include S. W. French, of Douglas, Ariz., and Charles E. Mills, of Morenci, Ariz.

EL PASO & SOUTHWESTERN.—Surveys in progress for a proposed extension from Nacozari west to Topolobampo, on the Pacific coast of Mexico, about 200 miles.

EL PASO, MOUNTAIN PARK & ST. LOUIS.—Successor to the El Paso, Mountain Park & Oklahoma Central, with offices at Mountain Park, Okla., and Kansas City, Mo. The proposed line is from St. Louis, Mo., southwest through Springfield and Joplin, Mo., Wagoner and Okmulgee, Ind., T., and Oklahoma City and Mountain Park, Okla. crossing the Red River into Texas at Quanah, and thence through northwestern Texas to Roswell, in New Mexico, and on to El Paso, Tex. Then it is proposed to continue on across the States of Chihuahua and Sonora to the mouth of the Sonora River, on the Gulf of California, 1,600 miles. Locating surveys have been made for 110 miles of the line, on which the maximum grade will be 0.8 per cent. and the maximum curvature 3 deg. Work to be begun this spring. R. K. Kelley is President, and Mark Roberts, Secretary.

EMORY VALLEY.—Surveys reported in progress for a projected road from a point on the Chattanooga Southern in Hamilton County, Tenn., to a point a few miles south of Chattanooga. S. B. Cook, T. P. McMahon and M. N. Hope, of Chattanooga, Tenn., are interested.

ENID, BEAVER, GUYMON & WESTERN.—Chartered in Oklahoma Territory to build a railroad from Enid through Garfield, Woods, Woodward and Beaver counties to Guymon, thence west to coal fields at Dorsey, N. Mex., a total of about 400 miles. R. B. Quinn and T. O. James, of Guymon; T. B. Bradford and George Healy, of Beaver City; W. I. Drummond, of Enid; J. E. George, of Liberal, Kan., and J. C. Gleicester, of New York, are incorporators.

ERIE.—New ferry slips and passenger station at Twenty-third Street and North River, New York. W. L. Derr, 26 Cortlandt Street, New York, is in charge of the work.

ERIE & MICHIGAN RAILWAY & NAVIGATION.—The proposed route of this road is not definitely located, but will probably be from Alabaster, Iosco County, Mich., to a connection with the Michigan Central at Standish, about 30 miles. O. B. Englisch, 184 La Salle street, Chicago, is Vice-President and General Manager.

ESCANABA & LAKE SUPERIOR.—Extension from Gleason, Mich., in a northeastly direction into timber lands, 13 miles. Projected. (Mar. 11, 1904.)

EUREKA & PALISADE.—Surveys reported in progress for the extension of this line from Eureka, Nev., southeast to Ely, 60 miles. G. D. Abbott, Palisade, Nev., is Superintendent.

*EVANSVILLE & EASTERN (Electric).—This company is building with its own forces an electric road from Evansville, Ind., via Newburg, Yankeetown and Hatfield to Rockport, 31 miles. Grading has been completed between Yankeetown and Rockport, 16 miles. H. A. Genung is Chief Engineer.

——Reported that an extension is projected from Rockport to Tell City, Ind., 40 miles.

EVANSVILLE, SUBURBAN & NEWBURG.—Extension from Newburg, Ind., to Boonville, 10.65 miles, or Rockport, 23 miles. Projected. The road is now in operation between Evansville and Newburg, 11 miles.

F

FAIRFIELD RAILROAD.—Proposed new line in South Carolina from Rockton to Alston, S. C., 20 miles. B. R. Heyward, Rion, S. C., is interested.

FAIRMONT & CLARKSBURG TRACTION.—This company, which operates 21 miles of standard gage trolley lines in Fairmont and Clarksburg, W. Va., has made arrangements to have $1,200,000 first-mortgage 5 per cent. bonds underwritten by Harvey Fisk & Sons, New York, the proceeds to be used in building a connecting line between Fairmont and Clarksburg, 15 miles. A. M. Young, William N. Barnum and Wilbur C. Fisk, all of New York, are on the board of directors.

FAIRMONT & COLFAX SHORT LINE.—New line between Fairmont and Colfax, W. Va., 6 miles. Surveyed. L. B. Harr, Fairmont, W. Va., is President. (Mar. 11, 1904.)

FALLON RAILROAD.—Proposed road from Leetville, Nev., to Fallon, 15 miles. Surveys reported made. R. L. Douglass, of Fallon, is President, and W. Fuller, Chief Engineer.

FARMERS' GRAIN & SHIPPING COMPANY.—Extension from Starkweather, N. Dak., to Rosedale, 25 miles. Surveys in progress. J. M. Kelly, Garske, N. Dak., is President. (Mar. 11, 1904.)

FARMVILLE & JAMES RIVER VALLEY.—New line from Rosney, Va., southwest to Danville, 80 miles. Surveys in progress. (Mar. 11, 1904.)

FELICITY & BETHEL.—Incorporated to build from Felicity, Ohio, to Bethel, 10 miles. W. A. Gregg, Felicity, Ohio, is interested. (Mar. 11, 1904.)

FENTON & THOMSON.—Incorporated to build from a point on the Chicago, Burlington & Quincy, two miles north of Fenton, Ill., to a point about three miles south of Thomson, 12 miles. H. W. Weiss, Hinsdale, Ill., and J. M. Deering, La Grange, Ill., are incorporators. (Mar. 11, 1904.)

*FLINT RIVER & GULF.—New line from Carlisle, Ga., northeast via Sylvester to Ashburn, 20 miles. Twelve miles are graded and rails laid on seven miles. This road will connect with the Georgia Northern at Carlisle, the Atlantic Coast Line at Sylvester and the Georgia Southern & Florida at Ashburn. C. A. Alford, of Willingham, Ga., is General Manager.

FLORENCE & CLIFTON.—Application made for charter to build from Florence, Ala., northwest to Clifton, Tenn., 40 miles. J. C. Janes, E. Watkins, R. W. Barr, and others, of Florence, Ala., are interested.

FLORIDA EAST COAST.—Extension from Homestead, 28 miles south of Miami, along Florida keys to Key West, about 136 miles. Projected.

FLORIDA GRAND TRUNK.—Line projected from Dothan, Ala., through Tallahassee, Fla., and along the west coast of Florida, with a branch to St. Andrew's Bay. Dr. J. A. McLeay, 516 Fourth National Bank Building, Atlanta, Ga., is interested.

FOND DU LAC & NORTHWESTERN.—This company proposes to build from Madison, Wis., to Fond du Lac. W. H. Phillips, Fond du Lac, Wis., is President.

FOREST PARK (Electric).—Reported that this company, which is building two miles of road in Troy, N. Y., will extend its line so as to connect with the Hudson Valley on the north and the Albany & Hudson on the south. The proposed line would connect Troy and Rensselaer.

FORT ADAMS, WOODVILLE & CENTERVILLE (Electric).—Application made for a charter to build an electric road about 34 miles long in Mississippi connecting the three towns named in the title. C. M. Stricker, Fort Adams, Miss., and W. L. Ferguson, Woodville, Miss., are incorporators.

FORT BRAGG & SOUTHEASTERN.—New line from Fort Bragg, Cal., to Healdsburg, 40 miles. Rights of way secured. W. J. Dingee, Oakland, Cal., is interested. (Mar. 11, 1904.)

FORT SMITH & NORTH ARKANSAS.—Chartered in Arkansas to build from Fort Smith to Webb City and thence through Madison and Newton counties to Harrison, 130 miles. Geo. Sengel, Fort Smith, Ark., is President, and W. H. Robbins, Secretary. (Mar. 11, 1904.)

FORT SMITH & WESTERN.—Surveys completed and rights of way being secured for a branch line from the Indian Territory boundary line to Coal Creek, Ind. T., 20 miles. Contracts for grading have not yet been let. H. A. Schwanecke, Fort Smith, Ariz., is Chief Engineer.

——Extension from Fort Smith, Ark., to St. Louis, Mo., 325 miles. Projected. (Mar. 11, 1904.)

FORT SMITH, INDIAN TERRITORY & TEXAS.—Final surveys being made for this proposed road from a point near Fort Smith in a southwesterly direction through Sebastian County to Cedars, Ind. T., and eventually to Denison, Tex. Connection will be made with the Kansas City Southern at Panama, Ind. T. J. F. Nelson, Fort Smith, Ark., may be addressed.

FORT WAYNE & NORTHERN (Electric).—Incorporated to build an electric line from Fort Wayne, Ind., north to Freemont, Steuben County, 45 miles. The directors are F. H. Cutshall, J. W. Wessel and others, of Fort Wayne.

FORT WAYNE & SOUTHWESTERN.—Rights of way are now being secured for this proposed road from Indianapolis, Ind., northwest to Fort Wayne, 95 miles.

FORT WAYNE & SPRINGFIELD.—Proposed extension from Decatur to Portland, Ind., passing through Berne, Geneva and Bryant, and paralleling the Grand Rapids & Indiana between these points. Surveys to be begun at once, and work to be started shortly.

*FORT WAYNE, VAN WERT & LIMA TRACTION.—This company has its road in operation from Lima, Ohio, northwest to Van Wert, 30 miles. The line from Van Wert northwest to Fort Wayne, Ind., 35 miles, is graded, fenced and bridged and track laying is in progress.

FRANKFORT & OHIO RIVER.—Incorporated in Illinois to build from West Frankfort, in Franklin County, Ill., through Williamson and Saline counties to a point on the Ohio River, in Gallatin County. The incorporators are: Jonathan Reeves, J. J. Duck, F. W. Krohn and H. F. Jones, all of Chicago.

FRANKLIN & PARKER'S LANDING (PENNSYLVANIA).—Chartered in Pennsylvania to build from Franklin, Pa., to Parker's Landing, in Armstrong County, 35 miles. Incorporated in the interests of the Pennsylvania Railroad for the purpose of providing a short parallel route for that portion of the Allegheny Valley Railroad which lies between the points mentioned.

FREDERICKSBURG & RAPPAHANNOCK.—New line from Fredericksburg, Va., through Culpeper and Sperryville to Washington, Va., 55 miles. The Eastern Virginia Construction Co., of which John S. Barbour, of Culpeper, is President, is financing this road.

*FREEO VALLEY.—Grading reported in progress on this proposed railroad from Eagle Mills, in Ouachita County, Ark., northeast to Princeton, in Dallas County, 25 miles. Two miles of track have been laid. Polk Bros., Camden, Ark., are the contractors. D. S. Gates, Eagle Mills, Ark., is President.

FREIGHT TERMINAL CO. (PITTSBURG).—This company has applied for a charter to build a freight tunnel under the principal streets of Pittsburg to connect the railroad freight houses with some of the principal warehouses and stores. R. E. Flinn and J. S. Weller are interested.

G

*GAINESVILLE & DAHLONEGA (Electric).—New line from Gainesville, Ga., to Dahlonega. Fifteen miles have been graded. Action will be taken about April towards resuming the work, which has been temporarily stopped. A. J. Warner, of Dahlonega, Ga., is interested.

GAINESVILLE MIDLAND.—This road, formerly the Gainesville, Jefferson & Southern, is reported about to begin work on an extension from Jefferson, Ga., to Athens, 18 miles. G. J. Baldwin, Savannah, Ga., is interested.

GALION SOUTHERN (Electric).—Incorporated in Ohio to build an electric railroad from Galion southeast to Fredericktown, 20 miles, passing through Crawford, Morrow and Knox counties. W. L. Ball, M. H. Arnold and A. A. Crawford, all of Galion, Ohio, are incorporators.

GARLAND WESTERN.—Extension of three years granted by the Arkansas State Board of Incorporators in which to build the first five miles of line. The road is projected to run from Hot Springs, Ark., in a westerly direction to Mena, 80 miles. S. W. Fordyce, Hot Springs, Ark., is President.

GEORGIA, FLORIDA & ALABAMA.—Extension from Cuthbert, Ga., to Columbus, 50 miles. Location surveys in progress. The road at present runs from Tallahassee, Fla., to Arlington, Ga., 81 miles, and from Arlington to Cuthbert, 26 miles. J. P. Williams, Savannah, is President.

GEORGIA NORTHERN.—Reported that this company has filed a petition to increase its capital stock to $500,000, the proceeds to be used to build an extension from a point between Moultrie, Ga., and Pavo, southeast to Valdosta, 35 miles. J. N. Pidcock, Jr., is General Manager at Moultrie.

GEORGIA ROADS.—Logging road from Box Springs, Ga., to Sulphur Springs, four miles. Projected. J. T. Broadnax, Box Springs, is interested.

GILPIN & CLEAR CREEK.—Incorporated in Colorado to build lines for hauling ore. The proposed route is from a point near Central City, Colo., northeast to Pactolus, 26 miles. The work is heavy, with maximum grades of 3 per cent. and a maximum curvature of 16 deg. Surveys by the Hall Construction Co. H. R. Carpenter, Central City, is Chief Engineer.

GLADDENS VALLEY.—New line from Cooks Mills Station, Bedford County, Pa., to Gladdens, five miles. Connection will be made with the Baltimore & Ohio at Cooks Mills Station. Charter granted. J. E. MacCloskey, Jr., Pittsburg, Pa., is President. (Mar. 11, 1904.)

*GOLDFIELD RAILROAD.—Extension of the Tonopah Railroad from Tonopah, Nevada, via Columbia to Goldfield, 31 miles. Under contract to McLean & McSweeney, of Tonopah. Work to be completed in June. R. W. Welsh is Chief Engineer.

——See Tonopah Railroad.

*GRAND FORKS & EASTERN (GREAT NORTHERN).—Contract let to Porter Bros., Duluth, for building a 25-mile extension of this road. The Grand Forks & Eastern is a branch of the Great Northern, and connects with the main line at Markus.

GRAND RAPIDS & CHICAGO (Electric).—This company has filed amended articles of incorporation, changing its name to the Grand Rapids & Kalamazoo Valley. The company was originally organized for the purpose of building an electric railroad from Grand Rapids, Mich., to Kalamazoo, 55 miles.

*GRAND RAPIDS & IONIA (Electric).—Contract for grading this proposed electric railroad from Grand Rapids, Mich., east to Ionia, 30 miles, has been let to Carlin & Co., of Canton, Ohio. The line parallels the Grand Trunk between these points. E. M. Hopkins, Detroit, is President, and C. H. Pomeroy, Saginaw, Treasurer.

GRAND RAPIDS, HOLLAND & CHICAGO.—Incorporated in Michigan to take over the property of the present Grand Rapids & Holland Railroad and operate the line under the above name. W. H. Beach, J. K. Andrews, A. L. Stephens and others, of Grand Rapids, Mich., are interested.

GRAND RAPIDS TERMINAL (GRAND TRUNK).—Incorporated in Michigan by the Grand Trunk for the purpose of building an extension of its Detroit, Grand Haven & Milwaukee division from its present station, along the bank of Grand river to Pearl street, in the city of Grand Rapids.

GRAND VALLEY, COLORADO RIVER & SOUTH PACIFIC.—Incorporated to build from Grand Junction, Colo., to the head of the Colorado River, 180 miles. Contracts for grading will be let as soon as the surveys are completed. The road is projected for a distance of 1,250 miles, running through the States of Colorado, Arizona and Utah, but the section out of Grand Junction will be built first. G. R. Propper, Basin, Utah, is President, and C. W. Haskell, Grand Junction, Colo., is Chief Engineer.

GRANGER, GEORGETOWN, AUSTIN & SAN ANTONIO (M., K. & T.).—This road was completed between Georgetown and Austin, 30 miles, last year. It will be extended to a connection with the San Antonio & Aransas Pass at San Marcos, Tex., about 50 miles. S. P. Fisher, St. Louis, Mo., is in charge of the work.

GRANITE CITY, ALTON & EASTERN.—Incorporated to build from Granite City, Ill., to Alton, 20 miles. J. D. McAdams, Alton, is interested. (March 11, 1904.)

GRANITE CITY, ST. LOUIS & EASTERN (Electric).—Incorporated in Illinois to build a belt railroad in and about Granite City. F. G. Niedringhaus, St. Louis, Mo., and W. W. Hanlon and C. F. Stelzel, of Granite City, Ill., are among the incorporators.

GRASSY CREEK.—Incorporated in West Virginia to build from Pickens, W. Va., to a point on the water shed between the Elk and Holly rivers. J. H. P. Smith, of Parkersburg, W. Va.; J. H. Fisher and Fred L. Fox, of Sutton, W. Va., are incorporators.

GRAY'S PEAK RAILROAD.—Incorporated in Colorado to build three lines from Silver Plume, one around Leavenworth to the base of Gray's Peak, another to Keystone and a third to Minturn, in Eagle County. C. J. Morley, Thomas Fielding and Nathan Gregg, Jr., of Denver, Colo., are incorporators.

Fairbanks-Morse Gasoline Motor Cars

FOR THE OFFICIALS TO REDUCE EXPENSES

A REVELATION IN MOTOR CAR BUILDING

SHEFFIELD INSPECTION MOTOR CAR NO. 16.
(Automobile Type.)

This car is arranged to seat nine people, and can be operated at any speed up to thirty-five miles per hour ahead, and twelve miles per hour reverse, at will of operator. Frame is made of steel, securely riveted. Axles equipped with roller bearings.

The car is regularly equipped with canopy top, glass front, and leather upholstered seats. Rear seats can be easily and quickly removed, thus making car available for carrying packages or material.

An ideal car for inspection trips in either summer or winter. Can also be used for passenger service on branch lines or small roads.

FOR THE SECTION MEN TO REDUCE EXPENSES

GANG AND FULL EQUIPMENT OF TOOLS AT 15 MILES PER HOUR

SHEFFIELD SECTION MOTOR CAR NO. 14.
(Automobile Type.)

Section Motor Car No. 14, in service, can be used by two or three men, or full gang. By its use every section hand is trained for inspection service.

Send for illustrated catalog No. 518.

FAIRBANKS, MORSE & CO.

Chicago	Detroit	New York	St. Paul	Denver	Portland, Ore.
Cincinnati	Louisville	St. Louis	Minneapolis	Los Angeles	Salt Lake City
Cleveland	Indianapolis	Kansas City	Omaha	San Francisco	London, Eng.

GREAT BEND & SOUTHERN.—Chartered in Kansas to build from Great Bend southeast through the counties of Barton, Stafford, Pratt and Harbor to Medicine Lodge, 75 miles. A. A. Patterson, Benton Harbor, Mich.; J. G. Brinkman and R. O. Russell, Great Bend, Kan., are incorporators.

GREAT NORTHERN.—Proposed extension from Sioux City, Iowa, to Omaha, Neb., connecting with the Burlington lines in western Nebraska, and giving short connections to the Pacific over both the Great Northern and Northern Pacific. This plan involves a large expenditure for terminal facilities in Sioux City.

——Ordinances submitted to the City Council of Sioux City, providing for the erection and maintenance of an elevated railroad structure along Third Street, commencing at Howard Street and ending at the combination bridge; and for the construction and operation of a surface spur track by the Great Northern along Third Street, from Jones Street west to Perry Creek, with spurs into intersecting cross streets. Work upon the improvements to begin within one year.

——Branch from Ephrata, Wash., north through Waterville, about 75 miles.

——It is reported that surveys are being made for a line from Rugby, N. Dak., to Balfour, on the Minneapolis, St. Paul & Sault Ste. Marie, and from there southwesterly to coal lands.

——*Extension from Thief River Falls northeast to Roseau, Minn., 50 miles. About 41 miles to Greenbush completed last year.

——Extension of the Pelican Rapids branch from Pelican Rapids, Minn., to Mackintosh, 70 miles. Location surveys completed and contracts will be let in the spring. (Mar. 11, 1904.)

——See Grand Forks & Eastern.
——See Iowa & Great Northern.
——See Minnesota & Great Northern.
——See Vancouver, Victoria & Eastern.
——See Vancouver, Westminster & Yukon.

GREAT NORTHERN OF GUATEMALA.—Reported that this company, in which Sir William Van Horne is interested, is rebuilding its line from Puerto Barrios to a point about 100 miles in the interior, and that the road will eventually be extended to Guatemala City.

*GREAT SOUTHERN.—A contract has been let to W. F. Nelson, of Seattle, Wash., for building this line from The Dalles, Ore., to Dufur, 30 miles. J. G. Heimrich, Seattle, Wash., is President.

GREENBACK RAILROAD.—Chartered by the Secretary of State of Tennessee to build a railroad from Greenback, Loudon County, to a connection with the Atlanta, Knoxville & Northern. J. H. Ellis, J. H. Ringgold and J. H. Frantz are incorporators.

GREEN BAY, OSHKOSH, MADISON & SOUTHWESTERN.—Rights of way are being secured for this proposed road from Madison, Wis., northeast to Green Bay, 150 miles. R. H. Hackett, Oshkosh, Wis., is reported interested.

GREENE COUNTY.—New line from Bishop, Pa., southeast, through Washington County and thence through Meadowlands and Arden, and through Greene County to Uniontown, Fayette County. Rights of way secured and surveys completed. J. T. Blair, Greenville, Pa., is President. (Mar. 11, 1904.)

*GREENVILLE & KNOXVILLE.—New line in South Carolina, from Greenville, S. C., northwest to Riverview, 21 miles. Work reported in progress and grading completed on 18 miles. E. E. McCollough, Greenville, S. C., is Chief Engineer, and H. M. Prince is President.

GREENVILLE & LELAND (Electric).—Incorporated in Louisiana to build an electric road from Greenville northwest to Leland, 10 miles. J. L. Hebron, Greenville, La., and J. W. Thompson, Leland, are incorporators.

GRINNELL INTERURBAN (Electric).—Incorporated in Iowa to build an electric road from Grinnell northwest to Belle Plaine, 30 miles. O. K. Cole, of Grinnell, Iowa, is President.

GULF & CHICAGO.—See Mobile, Jackson & Kansas City.

GULF & NORTHWESTERN.—Chartered in Texas with headquarters at Meridian. The proposed route is from Waco northwest to Palo Pinto, 100 miles passing through McLennan, Bosque, Hamilton, Hill, Comanche and other counties. W. M. Knight, E. B. Robertson, H. S. Hale, J. E. Turner, of Meridian, are interested.

GULF & PACIFIC.—Chartered in Texas to build from Velasco to Paris, 345 miles, with a branch line from a point in Anderson County to Dallas, Texas, 115 miles. Completed from Clinesburg on the Gulf, Colorado & Santa Fe, in Montgomery County, Texas, north to a point in San Jacinto County. T. J. Thornhill, R. S. Waldron, W. H. Steele and J. R. England, of Dallas, Texas, are incorporators.

*GULF & SHIP ISLAND.—This company has completed 15 miles of track. It is from a point north of Shivers, Miss., to Silver Creek. Work now in progress on an extention from Silver Creek south to Columbia, 27.6 miles. Grading completed for about five miles. Bowles & Hemmingway, Silver Creek, Miss., are the contractors.

GULF, CALCASIEU & NORTHERN.—New line from Lake Charles, La., north to Natchitoches, 100 miles. Surveys completed and contracts for grading will be let in the spring. The work will be light, with maximum grades of .8 per cent., and maximum curvature of 4 deg. H. B. Milligan, Lake Charles, is President, and J. T. Shutts, Chief Engineer.

GULF, HUTCHINSON & NORTHWESTERN.—Rights of way have been nearly all secured and surveys for this line finished. The proposed route is from Atwood, Rawlins County, Kan., through Oberlin, Jennings, Lenora and Webster to Stockton, 100 miles. Eugene Tilleux, Hutchinson, Kan., is President.

GULF, TEXAS & NORTHERN.—The proposed route of this road, which was organized in Texas, is from Sabine Pass, Tex., to Oklahoma City, Okla. T., 300 miles. W. L. Martin, W. C. Pierce, Jr., L. W. Lloyd, A. B. Blocker and others, of Marshall, Tex., are incorporators.

GULF, WESTERN TEXAS & PACIFIC (SOUTHERN PACIFIC).—Extension from Placedo, Tex., to Hines Bay, 25 miles. Surveys in progress. (Mar. 11, 1904.)

*GURDON & FORT SMITH (MISSOURI PACIFIC).—New line from Antoine, Ark., northwest to Greenwood, 100 miles. Under contract for five miles north of Antoine to the Dalhoff Construction Co. Four miles graded and track laid on three miles of this contract. H. Rohwer, St. Louis, Mo., is Consulting Engineer.

GUTHRIE, FAIRVIEW & WESTERN.—Proposed new line from Guthrie, Okla. T., northwest to Fairview, 70 miles. Connection will be made with the Kansas City, Mexico & Orient at Fairview. The work will be light, with a maximum grade of .8 per cent. W. S. McCaull, Guthrie, Okla. T., is President.

GUTHRIE RAILWAY (Electric).—Chartered in Oklahoma Territory to build from Edmond north to Guthrie, 20 miles. L. N. Beedles, J. R. Cottingham and George M. Green, of Guthrie and Oklahoma City, are incorporators.

H

HAMBURG & WESTERN.—New line from Lake Providence, La., through Hamburg and Monticello to Pine Bluff, Ark., 100 miles. Charter granted. J. M. Parker and J. C. Norman, Hamburg, Ark., are interested. (Mar. 11, 1904.)

HAMMOND & EASTERN.—The Hammond Lumber Co., of Hammond, La., which owns this railroad, is about to build an extension from the present terminus, four miles east of Hammond, to Covington, La., 20 miles. (Mar. 11, 1904.)

HAMMOND BELT RAILROAD.—Incorporated in Illinois to build from Osborn, Ind., in a northwesterly direction to Calumet Park, in Cook County, Ill., 8 miles. A. F. Knotts, Hammond, Ind., is interested.

HAMPTON & YORKTOWN (Electric).—Incorporated in Virginia to build an electric road between Hampton and Yorktown, 20 miles. Frank W. Darling is President.

HARBOR BEACH & PORT HOPE.—Incorporated in Michigan, to build from Harbor Beach north to Port Hope, 8 miles. M. J. Carpenter, J. H. Simpson and F. W. Stevens, of Harbor Beach, are directors. (Mar. 11, 1904.)

HARDMAN'S BRANCH.—Chartered in West Virginia to build from Hardman to Halleck, 7 miles. Hugh McNeil, Jr., of Baltimore, Md., and J. J. Baumgartner, Westminster, Md., are incorporators. (Mar. 11, 1904.)

HARRIMAN & OLIVER SPRINGS.—Chartered in Tennessee to build from Harriman in an easterly direction through Webster and thence in a northerly direction through Poplar Creek Valley to Oliver Springs, 15 miles. J. E. Rhodes, S. P. Sparks and S. C. Brown are incorporators.

HARRISON CENTRAL.—Proposed new line in Arkansas, from Harrison northeast to a point on the White River branch of the St. Louis, Iron Mountain & Southern near Keener, 10 miles. J. A. Bunch, Harrison, Ark., and T. N. Chenoweth, Mountain Home, Ark., may be addressed.

HELENA, TUPELO & DECATUR.—New line through Morgan, Lawrence and Marion counties, Alabama, to a point on the Mississippi State line. Surveys for the road have been finished, and rights of way are being secured. W. D. Anderson, Tupelo, Miss., is President. (Mar. 11, 1904.)

HELM & NORTHWESTERN.—Incorporated in Mississippi to build from Helm to Arnold, 22 miles. M. Gilleas, Memphis, Tenn., is President.

HIGH POINT & WINSTON-SALEM.—Projected road from Winston-Salem, N. C., southeast to High Point, 18 miles, paralleling the Southern, with an extension later of 25 miles. Reported that the construction of the first 18 miles will begin shortly.

HILLSBORO & SOUTHWESTERN.—Incorporated in Illinois to build from Hillsboro, Ill., to Alton, 40 miles. The incorporators are: Frank P. Blair and F. A. Chapman, of St. Paul, Minn., A. W. Crawford and others, of Hillsboro, Ill.

HOLLY RIVER & ADDISON.—Reported that this road, which is now in operation from Holly Junction, W. Va., on the Baltimore & Ohio southeast to Webster Springs, 30 miles, is about to be extended from Webster Springs to Bergoo, W. Va., eight miles. J. T. McGraw, Grafton, W. Va., is President, and George A. Hechmer, Palmer W. Va., Secretary and General Manager.

HOLLY SHELTER.—Chartered in North Carolina to build from Bannerman's Bridge to a point on Shaking Creek, 5 miles. H. A. Brown, Jr.; T. M. Myers, and others, of Wilmington, N. C., are incorporators. (Mar. 11, 1904.)

HORNELLSVILLE, BATH & LAKE KEUKA (Electric).—Incorporated at Albany, N. Y., to build an electric street railroad between the points named in the title. L. D. Masson and J. S. Hubbs, of Hammondsport, N. Y., and F. W. Hastings, of Bath, N. Y., are incorporators.

HOUSTON & GALVESTON INTERURBAN.—A charter has been granted this company in Texas to build an electric railroad between Houston and Galveston, 51 miles. Walter Gresham, Galveston; O. M. Whitcomb, Webster, Tex., and J. E. Lafferty, Houston, are incorporators.

HOUSTON, BEAUMONT & NORTHERN (ST. LOUIS & SAN FRANCISCO).—New line from Houston to a point on the Sabine River, 15 miles southeast of Newton, Texas, 140 miles. Charter approved. Among the incorporators are W. H. Lyford, Chicago; C. W. Hillard, New York; W. C. Preston, Fort Worth; B. F. Berger, S. A. McNelly and F. M. Aldrich, of Houston, Texas. (Mar. 11, 1904.)

HOXIE, STRAWBERRY RIVER VALLEY & WESTERN.—Surveys completed for this proposed road from Hoxie, Ark., northwest through Lawrence, Sharp and Izard counties to Franklin, 50 miles. Grading will be begun as soon as the rights of way have been secured. H. S. Thomas, Hoxie, Ark., is President.

HUDSON COMPANIES.—Incorporated in New York to merge control of the two tunnels now building under the Hudson River and the new subways in Manhattan which have been approved by the Rapid Transit Commission. By its control of the river tunnels and the city subways, not yet built, the Hudson Companies will connect the Delaware, Lackawanna & Western, Erie, Pennsylvania and possibly the Central Railroad of New Jersey terminals in Hoboken, Jersey City and Communipaw with the New York subway at Dey Street, and again at Fourth Avenue and Ninth Street and will furnish a direct route to Herald Square, N. Y., by the tunnel from Hoboken to Christopher Street and the subways in New York under Eighth Street and up Sixth Avenue. The Hudson Companies will build the Jersey City terminal station of the Pennsylvania under the present terminal, and has a 500 year contract to carry passengers and baggage from the terminal to points in New York.

HUMBOLDT NORTHERN.—Incorporated in California, to build from Arcata, Cal., to a point near the mouth of the Klamath River, in Del Norte County, 70 miles. Branches will also be built south from Arcata to Fairhaven, 15 miles, and in a westerly direction for a distance of 10 miles. W. Carson, J. M. Carson and A. H. Connick are named as incorporators.

HUTCHINSON & WESTERN (Electric).—Incorporated in Minnesota to build an electric road from Hutchinson west through the counties of McLeod, Meeker and Kandiyohi. E. L. McGrory, W. E. Ellis and Z. A. White, of Minneapolis, are incorporators.

I

IDAHO NORTHERN.—This road, which now runs from Nampa, Idaho, north to Emmett, 27 miles, will, it is reported, be extended from Emmett east to Horseshoe Bend, 20 miles.

IDAHO ROADS.—New line from Red Rock, Mont., through Boise City, Idaho, to the Columbia River, and thence to a connection with the Oregon R. R. & Navigation Company's lines. Surveys in progress. (Mar. 11, 1904.)

ILLINOIS & KENTUCKY.—Incorporated to build from a point in Williamson County, Ill., through Saline, Pope and Hardin counties.

ILLINOIS & MISSOURI.—Chartered in Illinois to build from Quincy, in Adams County, Ill., in a southerly direction through Melrose and Fall Creek to East Hannibal, in Pike County, Ill. E. H. Osborn and Lyman McCarl, of Quincy, Ill., are incorporators.

ILLINOIS & WISCONSIN.—Incorporated in Illinois to build from Chicago northwest to Barrington, 30 miles. R. E. Burke, C. E. Crafts and A. L. Shiffman, of Chicago, are interested.

*ILLINOIS CENTRAL.—Change of line between Port Jefferson and Wickliffe, Ky., about 4½ miles. The work involves the removal of about 500,000 cu. yds. of earth. W. J. Oliver & Co., Knoxville, Tenn., are the contractors, under the supervision of E. J. Rogers, Assistant Engineer.

——This company has incorporated two new companies at Springfield, Ill., to build branch lines south of Chicago. One is the Kensington & Eastern and the other the Indiana & Kensington. The former will connect the Chicago, Lake Shore & Eastern with the Illinois Central.

——*Grading and double tracking reported in progress on a section about 6½ miles long between Halls and Fowlkes, Tenn. L. Montville, Memphis, Tenn., has the contract. This is part of the work of double tracking the entire line between Woodstock and Fowlkes, Tenn., 65 miles.

——Extension from Jackson, Tenn., through Chester and McNairy counties, along the Tennessee River to Birmingham, Ala., 90 miles. Surveyed, but plans have not yet been approved. (Mar. 11, 1904.)

——See Canton, Aberdeen & Nashville.
——See Cedar Falls & Northeastern.
——See Yazoo & Mississippi Valley.

*ILLINOIS, IOWA & MINNESOTA.—Extension from DeKalb northwest to Rockford, 25 miles. In operation to Kirkland, 17 miles. Contract for remaining eight miles reported let. I. W. Troxel, Aurora, Ill., is Chief Engineer.

ILLINOIS ROADS.—New line from Etherley, Ill., south to Dahinda, 5 miles. Connection will be made with the Atchison, Topeka & Santa Fe at Dahinda. The road is to be built by the Knox Constr. Co. H. M. Chase and A. R. Cline, Etherley, Ill., are interested. (Mar. 11, 1904.)

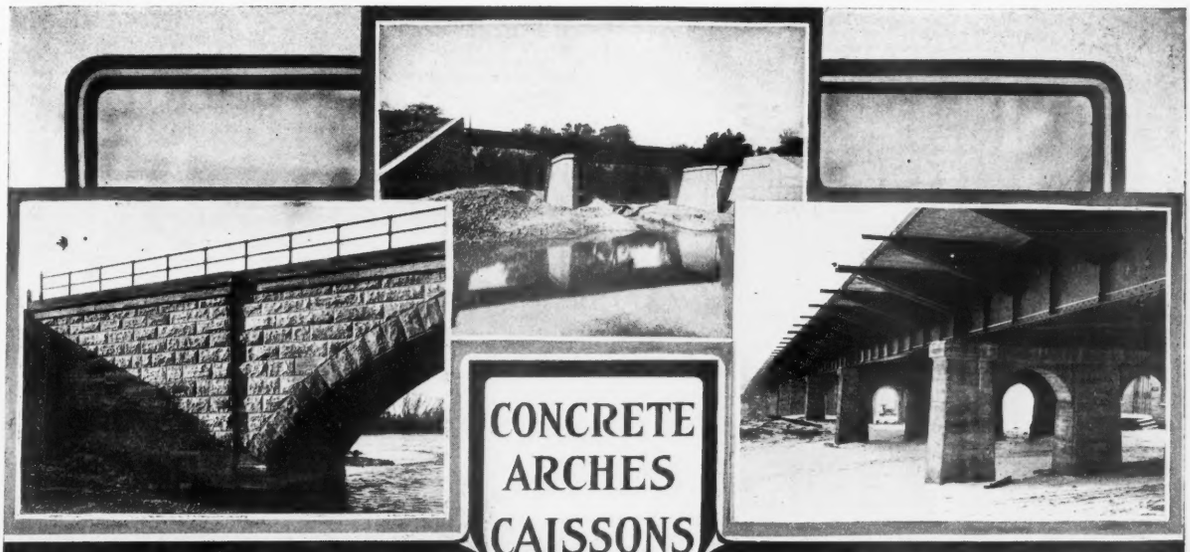
*ILLINOIS TRACTION SYSTEM.—New electric road, which will connect Decatur and Springfield, Ill., and St. Louis, Mo. 80 miles in operation; 60 miles under construction.

ILLINOIS UNION TRACTION.—Incorporated in Illinois to build a system of interurban electric roads north from Monmouth to Aledo, Rock Island and Muscatine, 60 miles, and south from Monmouth to Roseville, Macomb and Keokuk, 70 miles. P. E. Elting, Macomb, Ill.; W. H. Beaver, Abingdon, Ill.; S. S. Hallam, Monmouth, are incorporators. (Mar. 11, 1904.)

ILLINOIS VALLEY.—Incorporated in Illinois to build from Joliet southwest to Morris, thence west through Marseilles and Peru to Spring Valley. F. W. Bedard, La Salle, Ill., and C. E. Hook, Ottawa, are interested.

*IMBODEN & ODELL.—This company, which is building a road from Charleston, W. Va., via Blue Creek, Coco, Quick and Pond Gap, to Summerville, W. Va., 44 miles, has given a contract to T. J. Carmack, of Charleston, for building from Blue Creek Station to Quick, 10 miles; grading completed on this section and track laid from Blue Creek to Tunnel No. 1, two miles. The work includes one 350-ft. bridge and five tunnels. Contracts will soon be let for 25 miles from Charleston to Blue Creek, and from Quick to Pond Gap. C. P. Peyton, Charleston, W. Va., is Chief Engineer.

*INDIANA HARBOR.—Line from Indiana Harbor



CONCRETE
ARCHES
CAISSONS

PIERS, ABUTMENTS AND FOUNDATIONS

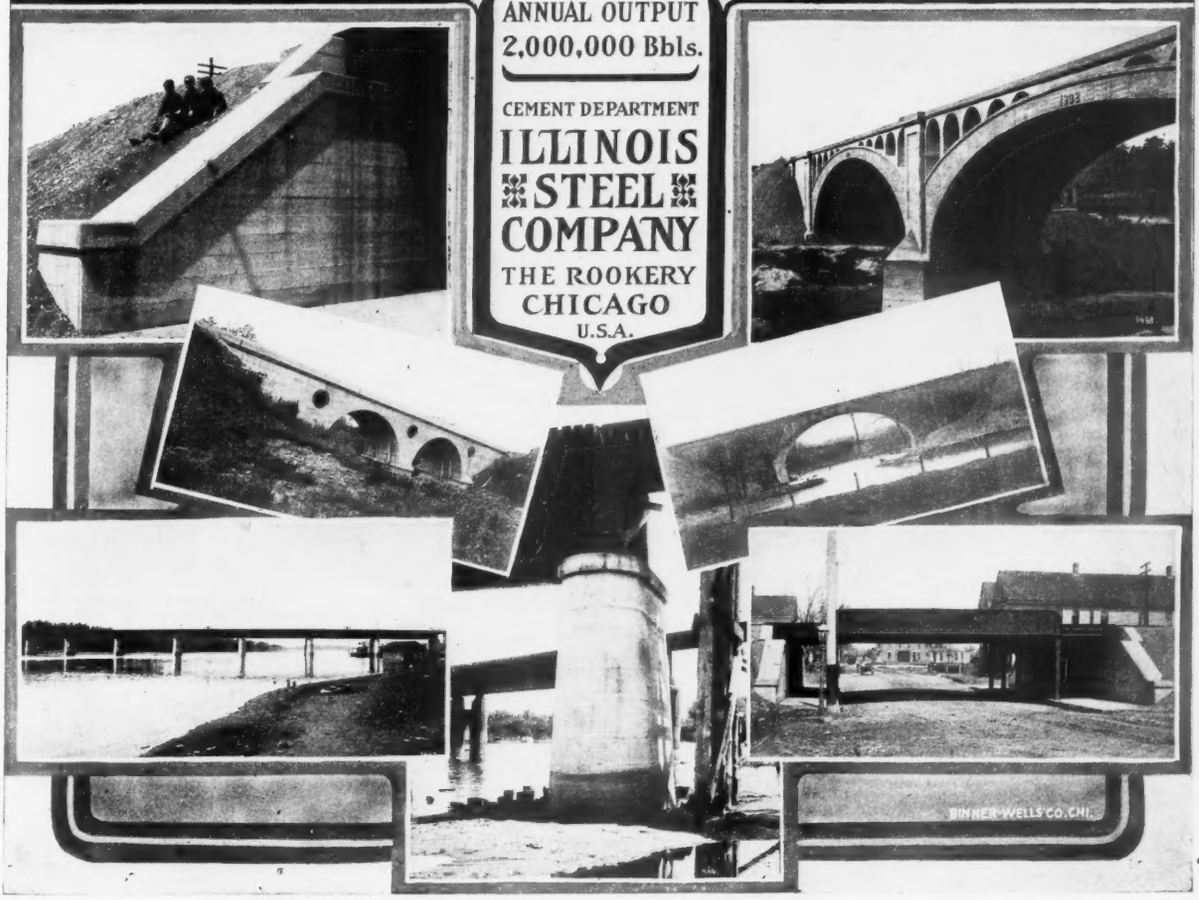
Built of

Universal Portland Cement

A STANDARD PORTLAND FOR UNIVERSAL USE

ANNUAL OUTPUT
2,000,000 Bbls.

CEMENT DEPARTMENT
ILLINOIS
STEEL
COMPANY
THE ROOKERY
CHICAGO
U.S.A.



on Lake Michigan, via Morocco and Kentland, Ind., across the Illinois State line near Thomas to Danville, Ill., 101 miles. Contract let to the Knickerbocker Ice Co. First six miles south of Indiana Harbor in operation as part of a belt line. Surveys completed for the remainder, and right of way for the northern portion secured. Construction work will be begun early this spring. There will be but three curves on the entire line, two of 0.5 deg. and one of 1 deg. The maximum grade is to be 12.5 ft. to the mile. C. W. Hotchkiss, 401 La Salle St., Chicago, is President, and R. B. Seymour, Chief Engineer.

*INDIANAPOLIS & CINCINNATI TRACTION.—Incorporated in Indiana to build from Cincinnati to Indianapolis, via Rushville, 125 miles. Line under construction. Townsend & Reed, contractors. C. L. Henry is President and General Manager.

INDIANAPOLIS & MARTINSVILLE RAPID TRANSIT.—Work will be begun on an extension of this electric road from Martinsville, Ind., to Bloomington, 24 miles, early this spring. Rights of way have been secured and local surveys completed. An extension is also proposed from Bloomington to French Lick, 50 miles. The headquarters of the company are at Indianapolis.

INDIANAPOLIS & OHIO VALLEY TRACTION.—Incorporated by J. H. Furimer and Butler Smith, of Indianapolis, and Peter Baker, of Troy, Ind., to build an electric railroad from Indianapolis 150 miles southwest through Bloomington, Bedford, Mitchell, Jasper and Evanston to Cannelton.

*INDIANAPOLIS COAL TRACTION.—Projected electric road from Indianapolis via Plainfield, Greencastle and Terre Haute to Sullivan, with a branch from Greencastle to Rockville, a total of 165 miles. In operation to Plainfield, 14 miles. Remainder under construction and expected to be finished this year. Henry L. Smith is General Manager.

*INDIANAPOLIS, DANVILLE & ROCKVILLE.—New line from Indianapolis to Rockville, 60 miles. Surveyed. Contract let and grading completed for the section from Indianapolis to Danville, 17 miles.

INDIANAPOLIS, NEWCASTLE & TOLEDO (Electric).—Incorporated in Indiana to build an electric railroad from Indianapolis through Newcastle to Winchester, 140 miles, with branch lines from Newcastle to Muncie and Richmond. D. M. Parry is President, and C. S. Hernly, Newcastle, Ind., is Vice-President and General Manager.

*INDIANAPOLIS SOUTHERN.—New line from Indianapolis, via Bloomington and Bloomfield, to Sullivan, 110 miles. Contracts let to the Kenefick Construction Co., Fitzgerald Bldg., Indianapolis. Grading completed for 52 miles. T. H. Hazelrigg, Indianapolis, is Chief Engineer. (Mar. 11, 1904.)

INDIANA ROADS.—The Sandusky Portland Cement Co., of Syracuse, Ind., will build a freight line from Syracuse to New Paris, Ind., six miles. Rights of way now being secured. (Mar. 11, 1904.)

INDIAN TERRITORY TRACTION.—Nine miles of this electric road, which carries freight as well as passengers, are in operation from South McAlester, Ind. T., to Alderson, and work is in progress on a further extension of six miles to Hartshorne. The projected length of the road is 39 miles. Lawrence P. Boyle, 814 Tacoma Building, Chicago, is President.

INTERBOROUGH.—This company has applied for authority to build a subway from Fourteenth Street and Union Square, New York City, up Broadway to Forty-second street. This line would make the third side of a triangle, with the present line up Fourth Avenue from Fourteenth Street to Forty-second Street as one of the other sides, and from Park Avenue and Forty-second Street under Forty-second Street to Broadway as the other.

INTERCITY LINK RAILROAD.—Two charters have been obtained by this company, one in New Jersey and the other in Pennsylvania, authorizing the construction of a tunnel under the Delaware River between Philadelphia and Camden, N. J. Clarence Wolf, Albert Wolf and W. D. Slanger are named as incorporators.

*INTERSTATE (MISSOURI).—Contracts for building this railroad from Kansas City to Duluth are reported let to the Quigley Construction Company, of St. Louis. The work will be in charge of A. C. Titus, chief engineer, and will be pushed from the southern terminus, with a branch line from Marceline, Mo., to Coon Rapids, Iowa, aggregating 1,600 miles. J. H. Pickering, Kansas City, is President.

INTERSTATE (VIRGINIA).—This company, which operates a line between Stonega and Appalachia, six miles, and a branch from Mud Lick to Rhoda, three miles, is planning an extension from Appalachia, where it connects with the Virginia & Southwestern and the Louisville & Nashville, through Rockwood and up Roaring Fork to Kelleyview, 15 miles.

*IONE & EASTERN.—Incorporated in California to build a railroad from Ione to Sutter Creek, 14 miles. Finished from Ione to Mountain Springs, 6½ miles. Work in progress to Amador, 6 miles further. Proposed branch from Sutter Creek to Volcano, 13 miles. H. E. C. Feusier, Ione, Cal., is Chief Engineer.

IONIA & OWOSSO (Electric).—Incorporated in Michigan to build an electric road from Ionia through Pewamo, Fowler, St. Johns and Burton to Owosso, 45 miles. The directors are: Governor A. T. Bliss, Saginaw; W. W. Steele and E. M. Hopkins, Detroit, and F. S. Porter, Lansing.

IOWA & GREAT NORTHERN (GREAT NORTHERN).—This company is reported incorporated, with a capital stock of $500,000, to build a connection at or near Sioux City, Iowa, between the Great Northern and the Chicago, Burlington & Quincy.

IOWA, ILLINOIS & MISSOURI.—Incorporated in Illinois to build from Dubuque, Iowa, south to St. Louis, passing through Davenport, Rock Island and Moline. G. T. Cram, St. Louis; S. S. Hall, Monmouth, Ill.; W. A. Rosenfeld, Moline, and A. F. Cutter, Davenport, Iowa, are incorporators. (Mar. 11, 1904.)

IRON MOUNTAIN CONNECTING.—Incorporated in Illinois to build from a point in St. Clair County, near the junction of the St. Louis, Iron Mountain & Southern, and the Illinois Central, northwest to the Mississippi River. F. J. McLean, of St. Louis, and H. L. Browning and W. S. Forman, of East St. Louis, are incorporators. (Mar. 11, 1904.)

IRVINGTON RAILROAD.—Incorporated in New Jersey to build a railroad two miles long from Elizabeth to Irvington. T. E. Swain, Camden, N. J., is an incorporator.

ITHACA-CORTLAND TRACTION.—Incorporated at Albany, N. Y., to build an electric line from Ithaca to Cortland, 22 miles, paralleling the Lehigh Valley. Contracts were to be let about March 1. H. L. Chandler, of Philadelphia, is Vice-President.

J

JACKSON & KANSAS CITY.—Incorporated in Tennessee to build from a point near Jackson, Tenn., to Dyersburg, 45 miles. M. B. Gilmore and S. H. Wallace, of Jackson, are incorporators. (Mar. 11, 1904.)

*JACKSON, ANN ARBOR & DETROIT TRACTION.—Incorporated in Michigan, with a capital stock of $2,500,000, to acquire electric lines from Jackson to Detroit, jassing through the counties of Jackson, Washtenaw and Wayne. In operation from Battle Creek to Jackson, 40 miles; from Jackson to Ann Arbor, 35 miles, under construction. U. S. Potter, Jackson, Mich., and G. W. Mechem, Battle Creek, Mich., are interested.

*JACKSONVILLE & SOUTHWESTERN.—See Atlantic Coast Line.

JAMESTOWN & YOSEMITE VALLEY.—Incorporated in California to build from Jamestown southeast to a point at or near Maricopa, 40 miles; also an intermediate branch 35 miles long extending into the Yosemite Valley. T. S. Bullock and S. D. Freshman, San Jose, Cal., are incorporators.

*JASPER & EASTERN (ATCHISON, TOPEKA & SANTA FE).—Contract let to the Lantry-Sharp Contracting Co., Gumbel Building, Kansas City, Mo., for the grading, bridging and tracklaying on this road from Kirbyville, Tex., to De Ridder, La., 45 miles. Work in progress. The company will eventually build to Alexandria, 35 miles further. C. F. W. Felt, Galveston, Tex., is Chief Engineer.

JEFFERSON & ATHENS.—Charter granted in Georgia to build from Jefferson, Ga., southeast to Athens, 15 miles. Preliminary surveys in progress. F. L. Pendergrass, Jefferson, Ga., is said to be interested.

JEFFERSON CITY, JERICHO & SOUTHWESTERN.—Proposed new line in Missouri from Minden, in Barton County, northeast to Eldon, 125 miles. Connection will be made with the Rock Island and the Lebanon branch of the Missouri Pacific at Eldon. J. C. Long, R. E. Collins, E. R. Chappell and J. B. Myers are named as incorporators.

JELLICO, BARBOURSVILLE, MANCHESTER & BEATTYVILLE.—Organized in Tennessee to build from Jellico, Tenn., northeast to Beattyville, Ky., 70 miles.

JENNINGS & NORTHERN.—Reported that this company is receiving bids for grading an extension from Jennings, La., to Keadle, 33 miles. C. C. Carey, Jennings, La., is Secretary.

JERICO & SOUTHWESTERN.—Incorporated in Missouri to build from Jerico, Mo., southwest for a distance of 20 miles to a connection with the Missouri Pacific. L. C. Gates, Jerico, Mo., may be addressed.

JOLIET, NEWARK & SOUTHWESTERN.—Incorporated in Illinois to build from Joliet west through Will, Kendall and La Salle counties, 55 miles. H. K. Thunemann, O. L. Miller, N. L. Sweetland and R. C. Bibbins, all of Newark, Ill., are incorporators.

JONESBORO RAILROAD.—Incorporated in Maine to build a steam or electric railroad from Jonesboro west through the towns of Jonesboro, Addison, Columbia Falls, Columbia and Harrington. (Mar. 11, 1904.)

JOPLIN, NEOSHO & PIERCE CITY (Electric).—New electric line from Joplin, Mo., through Sarcoxie, Pierce City and Granby to Neosho, 35 miles. Surveys completed. The incorporators are W. S. Brawner, John Kimpel and John Weathers and others of St. Louis. (Mar. 11, 1904.)

K

KALAMAZOO & CHICAGO.—Maps filed by this company showing a change in the location of its proposed belt line in Kalamazoo, Mich. M. H. Lane is President.

KALAMAZOO & LAKE SHORE (Electric).—Proposed electric road from Kalamazoo, Mich., to Benton Harbor, and thence north via Paw Paw Lake to South Haven, a total distance of 80 miles. J. A. Mullins, Kalamazoo, Mich., may be addressed.

KANAWHA & EASTERN.—Charter granted in West Virginia to build from Plymouth on the Chesapeake & Ohio, in Putnam County, to the mines of the Alpha Coal Co., 10 miles. Names of incorporators not stated.

*KANAWHA & POCAHONTAS.—Organized in West Virginia. Road built from Paint Creek Junction to Mahan, 15 miles. From Mahan to Mossy Creek under construction. C. M. Pratt, Pratt, W. Va., is President, and O. A. Vesey, Pratt, W. Va., Chief Engineer.

KANAWHA, GLEN JEAN & WESTERN.—This new line has been completed for four miles, from Thurmond, W. Va. The proposed route extends to Kilsyth, 11 miles from Thurmond. T. C. McKell, Chillicothe, Ohio, is President, and Thomas Nichol, Kilsyth, W. Va., is Chief Engineer.

KANKAKEE & MOLINE.—Incorporated in Illinois to build from Kankakee through the counties of Kankakee, Grundy, La Salle, Henry and Rock Island to Rock Island City. William R. Burleigh, La Grange, Ill., and Gideon S. Thompson, Berwyn, Ill., are incorporators.

KANSAS & OKLAHOMA INTERURBAN.—Chartered in Oklahoma with headquarters at Kansas City, Mo., and an authorized capital of $1,000,000. The proposed road includes the city lines in Arkansas City and Winfield, Kan., and Chilocco, Okla. T. A. J. Hunt, Arkansas City; W. C. Robinson, Winfield, Kan., and Charles Johnson, Newkirk, Okla. T., are incorporators.

KANSAS CENTRAL, OKLAHOMA & GULF.—Amendment filed to charter changing the name of the company to the Dominion & Gulf and increasing the capital stock from $20,000,000 to $50,000,000. The proposed route of the road is from Enid, Okla. T., south to New Orleans, La., and Galveston, Texas. F. C. Spaulding, Kansas City, Mo.; J. A. Koontz, Hutchinson, Kan., and J. H. Ledgerwood, Guthrie, Okla. T., are incorporators.

KANSAS CITY & LEXINGTON (Electric).—New company in Missouri to build between the points named, 40 miles. Surveys and rights of way being secured. Incorporators are: James C. McGrew, E. M. Taubman, of Lexington. (Mar. 11, 1904.)

KANSAS CITY & TOPEKA (Electric).—Chartered in Kansas to build an electric road from Topeka east to Kansas City, 55 miles. J. A. Van Osdol, Anderson, Ind., is President.

KANSAS CITY, BURLINGAME & WESTERN.—The proposed route of this road is from Kansas City, Mo., southwest through Olathe, Edgerton, Baldwin, Willow Springs and Burlingame to Council Grove, 131 miles. The maximum grade will be 1 per cent. and the maximum curvature 4 degrees. Rights of way secured and surveys completed. A. L. Hartbridge, Olathe, Kan., is Chief Engineer.

*KANSAS CITY, MEXICO & ORIENT.—New line from Kansas City, Mo., via Wichita, Kan., Fairview, Okla. T., Sweetwater and Presidio, Tex., across the international boundary into Mexico and via Chihuahua, Minaca and El Fuerte to Topolobampo, on the Pacific coast of the State of Sinaloa, 1,630 miles. From Kansas City to Lone Wolf, 436 miles, under contract to the Union Construction Co., of Kansas City; from Lone Wolf to Topolobampo, 1,194 miles, under contract to the International Construction Co., of Kansas City. In operation from Wichita, Kan., to Fairview, Okla. T., 130 miles. Grading completed from a point 30 miles north of Wichita through Wichita and Fairview to a point 100 miles south of Fairview, a total of 260 miles; also from Diaz, Tex., to Sweetwater, 130 miles, and for 25 miles south of Sweetwater. Track laid for 10 miles north of Sweetwater.

——*On Mexican division, grading completed for 75 miles east of Chihuahua, for 40 miles southwest of Minaca and for 75 miles northeast of Topolobampo. Track laid for 35 miles east from Chihuahua, for six miles west of Minaca and road in operation from Topolobampo northeast to El Fuerte, 62 miles. Further track laying under way on these sections of the line. The Chihuahua & Pacific, which is to be part of the system, is in operation from a point west of Chihuahua to Minaca, 125 miles.

See Kansas City, Outer Belt & Electric.

KANSAS CITY, NEVADA & SPRINGFIELD.—(MISSOURI PACIFIC).—Incorporated in Missouri to build from Nevada, Missouri, through Dade and Cedar counties to Springfield, 72 miles. John M. Meehan and Fred J. Smith, of Chicago, Ill., and Joseph French and Thomas Waddell, of Pierce City, Mo., are incorporators.

*KANSAS CITY, OKLAHOMA & HOUSTON.—Grading in progress on this proposed road between Honey Grove, Tex., and the Red River, 22 miles. Contracts for grading 84 miles from the Red River to a point in Indian Territory on the Choctaw, Oklahoma & Gulf will soon be let. M. J. Smith, South McAlester, Ind. T., is Chief Engineer; B. P. Beam, Kansas City, Mo., is President.

KANSAS CITY, OLATHE, LAWRENCE & TOPEKA (Electric).—Chartered to build an electric road from Topeka east to Kansas City, 55 miles. Alexander Monroe and J. M. Roberts, Lawrence, Kan., and E. Baldwin, Lakeview, Kan., are incorporators.

*KANSAS CITY, OUTER BELT & ELECTRIC.—This company, which is the Kansas City terminal of the Kansas City, Mexico & Orient, has let the contract for building about seven miles of double track to L. J. Smith, of Kansas City. The line is to be built with reinforced steel concrete culverts and abutments, plate girder bridges and 80-lb. rails. It will connect with every railroad entering Kansas City.

KANSAS CITY, TULSA & SOUTHWESTERN.—New line incorporated in Oklahoma with a capital of $2,000,000. The proposed route of this road is from a point in Kansas near Chetopa to Wichita Falls, Tex., passing through Tulsa, Ind. T., and Shawnee, Okla. T. Surveys have been finished for about 100 miles. The maximum grade will be .6 per cent., and the maximum curvature, 3 degrees. The work will include six steel bridges. Grading will be begun at once on the northern end. Jay Forsythe, Tulsa, Ind. T., is President, and W. H. Hendren, General Manager and Chief Engineer.

KANSAS, GALATIA & SMOKY VALLEY.—Incorporated in Kansas to build from Lorraine, through Ellsworth, Rush, Barton and Ellis counties, to Ellis, 75 miles. James Armstrong, Galatia; W. M. Whitelaw, Kansas City, and F. W. Casnew, Hutchinson, are incorporators. (Mar. 11, 1904.)

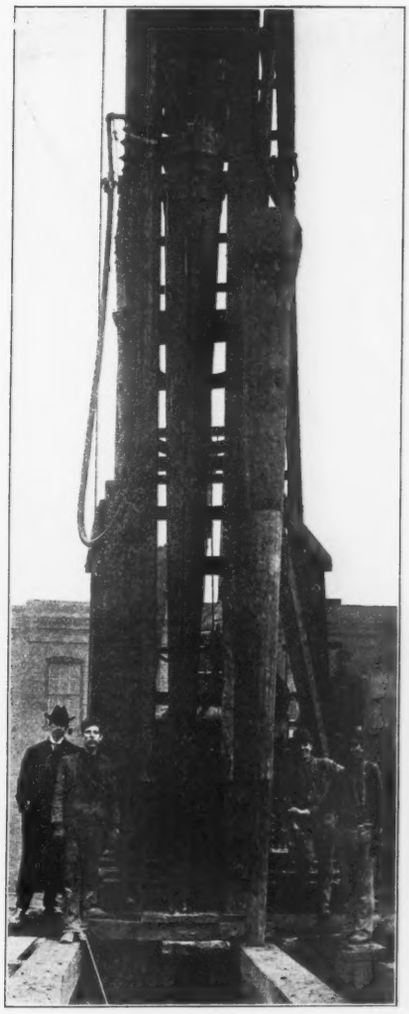
KANSAS & OKLAHOMA INTERURBAN.—Surveys reported completed for this proposed electric road to connect Arkansas City, Kan.; Chilocco, Okla. T.; Gueda Springs and Winfield, a total distance of 50 miles. W. C. Robinson is Presi-

Raymond Concrete Piles

Used and approved by United States Government, leading Engineers and Architects throughout the United States.

A FORM FOR EVERY PILE **NO WORKING IN THE DARK**

Raymond Pile-Core and Shell for placing Concrete Piles.



We license Railroad Companies and Contractors to operate under our patents

Full information upon request

Raymond Concrete Pile Co., 135 Adams Street CHICAGO

Test made by Government Engineers, United States Naval Academy, Annapolis, Maryland. **One RAYMOND CONCRETE PILE, 22 ft. 6 inches in the ground, driven in sand and clay fill, soft bottom, was loaded with 133,270 lbs. without appreciable settlement. This proves without question the superiority of a TAPERING concrete pile.**

dent. W. H. Somermeir, of Winfield, and A. J. Hunt, of Arkansas City, are interested.

KANSAS, OKLAHOMA & POTEAU.—Incorporated in Oklahoma Territory, with a capital stock of $10,000,000, to build from Guthrie, Okla. T., east through Logan, Lincoln and Payne counties to Wagoner, Ind. T., and another line from a point near the Kansas State line in the northwesterly part of the Osage Nation through Pawnee County, Okla. T., and the Creek Nation, by way of an intersection with the first-mentioned line, to Poteau, Ind. T. J. W. McNeal and Luther West, of Guthrie, and Frank M. Daly, of Nevada, Mo., are incorporators.

KANSAS, OKLAHOMA, TEXAS & GULF.—Incorporated in Oklahoma Territory, with a capital stock of $10,000,000, to build a road from Coffeyville, Kan., southwest through the Cherokee and Osage nations and Pawnee, Payne, Logan, Kiowa and Greer counties, Okla. T., to a point on the Fort Worth & Denver City, in the southwestern part of Collingsworth County, Tex. James H. Hunter and W. E. Minton, of Kansas City, and Thomas L. Eggleston, of Granite, Okla. T., are incorporators.

KANSAS, OKMULGEE & GULF.—Chartered to build from Kansas City to a point on the Red River in the Choctaw Nation, Okla. T. The authorized capital is $2,500,000, and the length of the line as projected is about 600 miles. W. W. Whitten, M. L. Bozarth and William Jackson, of Okmulgee, Ind. T., are reported interested.

KANSAS RAILROAD.—Chartered in Kansas to build from a point on the Missouri State line through Crawford, Neosho, Wilson, Elk, Butler and other counties to the Oklahoma State line. T. J. Hudson, T. F. C. Dodd and T. C. Babb, all of Fredonia, Kan., are incorporators.

KANSAS SOUTHERN (Electric).—Incorporated in Kansas to build an electric line from Kansas City to Bassett, Kan., with several branch lines; about 170 miles in all. F. V. Crouch, Iola, Kan., may be addressed.

KEARNEY & SHERIDAN.—Chartered to build from Kearney, Jefferson County, Ark., southwest to a point in Grant County, 15 miles. J. B. York and J. W. Rutherford, of Kearney, Ark., are incorporators.

KENDALL & SULPHUR SPRINGS.—Chartered in Arkansas to build from a point in Cleveland County northeast to a point near Sulphur Springs, Jefferson County, with a branch northwest to Darysaw, in Grant County, a total of 20 or 30 miles. W. E. Graham, M. F. Dail and N. T. White, of Kendall, Ark., are interested.

KENOSHA & LAKE GENEVA (Electric).—Incorporated to build from Kenosha, Wis., west to Lake Geneva, on the Chicago & North Western, 32 miles.

*KENTUCKY MIDLAND.—Proposed new line in Kentucky from Madisonville, Ky., southeast to Central City, 26 miles. Work is being done by the company's forces. Grading completed. M. M. Wheeler, Earles, Ky., is Chief Engineer.

KENTUCKY ROADS.—Surveys practically completed for a road from Cannel City, Morgan County, Ky., to Caney, five miles. The White Oaks Coal Co. is behind the project. W. B. Smith, Paducah, Ky., is President. (Mar. 11, 1904.)

——New line from Wheateroft, on Illinois Central, southeast to Providence, on Louisville & Nashville, 10 miles. Projected. I. H. Wheatcroft, Wheateroft, Ky., is interested. (Mar. 11, 1904.)

——Reported that a company will be organized to build a railroad 200 miles long from Newport, Ky., through Alexandria, Mount Olivet, Carlyle, Frenchburg, West Liberty and Prestonburg to Pikesville. W. H. Sloan, Cincinnati, Ohio, is said to be interested.

KETTLE VALLEY.—The Republic & Kettle River and the Kettle River Valley, which run from Republic, Wash., north to Grand Forks, B. C., 42 miles, together known as the Kettle Valley Lines, are reported to be interested in a survey for an extension south from Republic, across the southern part of the Colville reservation to Spokane.

——Surveys in progress for the proposed North Fork branch of this road from Grand Forks, B. C., to Franklin Camp, 50 miles up the Kettle River. A subsidy of $3,200 per mile was recently voted the company by the Dominion Government.

KINGSTON & EMORY GAP.—Incorporated in Tennessee to build from Kingston northwest to a point on the Tennessee Central near Emory Gap, about six miles.

KISHACOQUILLAS VALLEY.—Extension from Belleville, Pa., to McAlaney's Fort, by way of Greenwood Furnace, 12 miles. Work to begin soon. Surveys. J. P. Getteer, Belleville, Pa., is General Manager. (Mar. 11, 1904.)

KITTANNING RUN.—Chartered in Pennsylvania to build a line from Altoona to Ansbury, Cambria County, 10 miles. The capital is $100,000, and C. A. Buch, of Philadelphia; John Lloyd, Charles C. Renshaw and Walter N. Wood, of Altoona, are incorporators.

KLAMATH LAKE.—Surveys reported completed for an extension of this road from Pokegama, Ore., in an easterly direction for 25 miles. H. Lindley, Pokegama, is President.

KOHALA & HILO. (Hawaii).—Projected branch line from Hilo to Hakalau, 15 miles. The work will include several steel trestles from 40 to 100 ft. in height. Robert Hawxhurst, Jr., Hilo, Hawaiian Islands, is Chief Engineer.

L

LACKAWANNA & WYOMING VALLEY (Electric).—Rights of way reported secured for an extension from Wilkesbarre, Pa., southwest to Sunbury, 60 miles. The road runs from Wilkesbarre northeast to Scranton, 20 miles, and an extension from Scranton to Carbondale is now being completed.

LAC LA BELLE & CALUMET.—Surveys are being made under the charter of this road for a line from Red Jacket, Mich., through Kearsage, Wolverine, Allouez, Mohawk and Phœnix to Lac La Belle, 50 miles. Surveys for an extension from Lac La Belle to Keweenaw will probably be made later.

LAKE & RIVER.—Organized to build a line from Sandusky, Ohio, to Beaver, Pa., including the old Ashland & Wooster, and also a line from Akron, Ohio, to Youngstown. Both these lines will be leased and operated by the Lake & River. C. W. French, President of the Chicago Short Line, is interested. (Mar. 11, 1904.)

LAKE ERIE & FORT WAYNE.—Articles of incorporation filed in Indiana by this company to build a line 25 miles long in Allen County, around the city of Fort Wayne. H. C. Rockhil, C. H. Rawlins, P. A. Randall and W. J. Vesey, of Fort Wayne, are incorporators.

*LAKE ERIE & PITTSBURGH.—This road has been completed from Lorain southeast to Berea, 13 miles, and it will be extended from Berea northeast to a point within the city limits of Cleveland, from which a branch will be built to connect with the Newburg & South Shore. Grading in progress from Berea east across the Cuyahoga River to a point near Hudson, 17 miles. The road will eventually be built via Streetsboro, Freedom, Newton Falls, Niles and Girard to Youngstown and Lowellville. William Kenefick, Kansas City, Mo., is President.

LAKE SHORE & MICHIGAN SOUTHERN.—Surveys reported in progress for a cut-off from La Porte, Ind., to Pine, 35 miles.

LAKE SUPERIOR & NORTHERN.—Incorporated in Minnesota to build a number of logging roads throughout the State. H. P. Gardiner is Secretary, and L. R. Martin is President.

LAKE SUPERIOR & SOUTHEASTERN.—Proposed new line in Wisconsin, from Superior southeast through Douglas, Washburn, Bayfield, Sawyer and other counties to Marshfield, 100 miles. R. T. Merrill, C. E. Carter and H. D. Van Dyke, of Milwaukee, Wis., are incorporators.

LAKE TAHOE RAILROAD & TRANSPORTATION CO.—Incorporated to build from Truckee, Cal., to Lake Tahoe, 15 miles. Surveys reported in progress. W. S. Bliss, Crocker Building, San Francisco, is Chief Engineer.

LANSING MANUFACTURERS' RAILROAD.—Proposed belt line, six miles long, around the city of Lansing, Mich. J. H. Seagar, Houston, Mich., is President.

LARAMIE, HAHN'S PEAK & PACIFIC.—Capital reported furnished to complete this line to Centennial and eventually to Grand Encampment. The line is graded from Laramie, Wyo., to Centennial, 30 miles, and seven miles of track have been laid. Work is to be continued at once. F. A. Miller, Laramie, Wyo., is President.

LAUREL RAILROAD.—Incorporated in Johnson County, Tenn., with capital of $10,000. H. A. Domes, J. C. Butler and W. T. Smyth are incorporators.

LAWRENCEVILLE & WESTERN.—Incorporated in Virginia to build from Lawrenceville northwest to Cochran, six miles, where connection will be made with the Seaboard Air Line. E. P. Buford, Lawrenceville, Va., is President.

LECKRONE & LITTLE WHITELEY CREEK.—Proposed road from the mouth of Little Whiteley Creek, Green County, Pa., to Waynesburg, 15 miles. Surveys reported under way.

LEECH LAKE & NORTHERN.—Incorporated in Minnesota to build a railroad to a large tract of pine land. M. H. McCarthy, Dubuque, Iowa, and Augustus W. Clapp, St. Paul, are incorporators.

LEHIGH VALLEY.—Lehigh & Lake Erie extension from Tifft Farm, N. Y., to a connection with the main line near Depew, 10 miles. Granted by the New York State Railroad Commission. No work done.

——*Extension three miles long to the plant of the Lackawanna Steel Co. at West Seneca, N. Y. Building.

LEWISTON & OWYHEE.—New line from Huntington, Ore., to Lewiston, Idaho, 200 miles. Surveys in progress. M. O. Reed, Colfax, Wash., is President, and G. B. Baker, Dayton, Wash., Secretary. (Mar. 11, 1904.)

LEWISTON & SOUTHEASTERN (Electric).—Construction work has been begun on this electric road from Lewiston, Idaho, through Westlake, Cottonwood and Denver to Grangeville, Idaho, with a branch from Westlake to Nez Perces City, a total of 110 miles. The road is being built largely for freight traffic. F. W. Kettenbach, Lewiston, and Judson Spofford, Boise, Idaho, reported interested.

LEXINGTON SUBURBAN (Electric).—Proposed electric line in Missouri from Henry, in Ray County, through Lexington to Mayview, 25 miles. Gustav Haerle, Lexington, Mo.; A. G. Southerland and L. R. Ash, of Kansas City, are incorporators.

LIBERTY CITY, GLENNVILLE & MANASSAS.—Proposed new line in Georgia from Liberty City to Manassas, about 40 miles. H. W. Tippins, Manassas, Ga.; W. H. Bradley, Waycross, Ga., and J. K. Hines, Atlanta, Ga., are incorporators.

*LICKING RIVER.—Extension from Morgan, Ky., southeast, 8 miles. Completed for a distance of three miles. (Mar. 11, 1904.)

LINCOLN & ONEIDA COUNTY.—Proposed line in Wisconsin from Jeffris northeast into Oneida County, 12 miles. J. H. Woerden, E. N. Morrill and Edward Faust are incorporators.

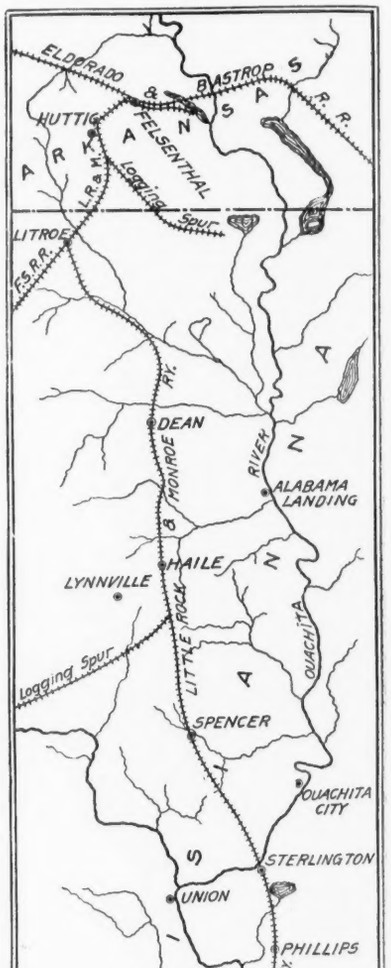
*LINCOLN, SAN FRANCISCO & EASTERN.—New line from Vernon Landing, Cal., through Lincoln, Spenceville and Grass Valley to Nevada City, 68 miles. Grading has been completed for 10 miles, and track laying is in progress. Bids for grading the remainder of the road have been asked for, and contract will be let soon. Contracts for ties, rails and bridges have not yet been let. C. L. Wilson, Room 18, Nevada Block, San Francisco, Cal., is President. (Mar. 11, 1904.)

LITCHFIELD & MADISON.—Branch line from the main line to mines at Staunton, Ill. Projected. The road now runs between Litchfield, Ill., and Bridge Junction, 48 miles. John R. Ramsay, St. Louis, Mo., is General Manager. (Mar. 11, 1904.)

LITTLE BAY & HAMPTON.—Incorporated in Arkansas to build from Little Bay through Gordon and Woodberry to Hampton, 20 miles. H. M. McLachlin, Little Bay, Ark., is President.

*LITTLE RIVER.—Main line from Maryville, Tenn., to Cades Cove, 26 miles, completed. Work in progress on a branch line from a point near Townsend southwest four miles. G. B. Townsend, Townsend, Tenn., is Chief Engineer.

LITTLE ROCK & MONROE.—This road is completed from Felsenthal, Ark., on the El Dorado & Bastrop, south across the Louisiana State line



Little Rock & Monroe.

to Monroe, 45 miles. The line penetrates a rich timber district. An ultimate extension from Felsenthal north to Little Rock, 115 miles, is planned. W. B. Arnold, Huttig, Ark., is General Superintendent.

LITTLE ROCK & SOUTHERN.—Projected to run from Hot Springs, Ark., in a southeasterly direction through Saline County to Traskwood and thence through Grant, Dallas, Calhoun and Bradley counties to the southern boundary line of the State of Arkansas, with branch line to a point near Eldorado. This road is a project of the Rock Island.

LIVE OAK & PERRY.—This company, whose road runs from Live Oak, Fla., southwest 22 miles to a point in Lafayette County, proposes an extension of 45 miles to Perry, in Taylor County, and thence to the mouth of the Aucilla River. Thomas Darling, Live Oak, is President.

LIVE OAK & SUWANEE SPRINGS.—Chartered in Florida, with a capital stock of $20,000, to build six miles of railroad. The general offices are at Live Oak, and F. L. Rey and B. W. Helvenston are incorporators.

LONE ROCK & LA VALLE.—Surveys will be begun at once on the proposed route of this road

RECEIVED GRAND PRIZE AND GOLD MEDAL THE HIGHEST AWARD FOR EXCELLENCE OF MATERIAL
LOUISIANA PURCHASE EXPOSITION, ST. LOUIS, 1904

DOUBLE STRENGTH CULVERT PIPE

Railroad Standard

36, 30 and 27 Inch

Three-Foot Lengths

FOR SEWERS, CULVERTS AND WATER CONDUITS

Single and Double Strength.
Deep Sockets, Corrugated Ends.
Cleaner and More Convenient to Lay than Brick
Cheaper and More Durable than Iron

WE MAKE ALSO THE BEST LOCOMOTIVE ARCH TILES

WE SHALL BE GLAD TO HAVE YOUR INQUIRIES

EVENS & HOWARD FIRE BRICK CO.

ST. LOUIS, U. S. A.

RECEIVED GRAND PRIZE AND GOLD MEDAL THE HIGHEST AWARD FOR EXCELLENCE
IAL
LOUISIANA PURCHASE EXPOSITION, ST. LOUIS, 1904

from Lone Rock, Wis., through Plano, White Mound and Ironton to La Valle, 35 miles. George Jameson, Lone Rock, Wis., may be addressed.

LONG ISLAND.—President Potter states that the company is expending or plans to expend $40,000,000 on improvements. By June 1, the company expects to finish the electrification of 45 miles of road, including the line from Flatbush Avenue to Queens and Belmont Park, from Woodhaven Junction to Rockaway Beach, from Hammels to Valley Stream and from Valley Stream to Jamaica. In addition, the company plans to electrify the North Shore branch to Whitestone Landing and to Port Washington from Long Island City, and the line from Long Island City to Manhattan Beach.

——*The two principal improvements now under way are: (1) The elimination of grade crossings along Atlantic Avenue, Brooklyn, from Flatbush Avenue to Woodhaven Junction, and new terminal facilities at Flatbush Avenue Station, which will have cost, when completed, $5,000,000; and (2) the elimination of grade crossings and general improvements on the Bay Ridge line from East New York to Bay Ridge. The Bay Ridge line crosses 115 streets at grade, and this work, with the relaying of the light track with 100-lb. rails, will cost about $6,000,000.

——Proposed improvements in Bay Ridge terminal at a cost of about $750,000.

LOUISA RAILROAD.—Incorporated in Kentucky to build from a point on the Big Sandy River, in Lawrence County, to Louisa, Ky., four miles. W. L. Watson and F. J. Nixon, of Louisa, are incorporators. (Mar. 11, 1904.)

LOUISIANA & ARKANSAS.—This road was organized to take over the assets of the Louisiana & Arkansas Railroad, operating a line 125 miles long between Stamps, Ark., and Winnfield, La. The present management has completed the northern extension from Stamps to Hope, 22½ miles, and the southern extension from Winnfield, La., to Jena, 39½ miles, making a total

Louisiana & Arkansas.

length of 187.2 miles. The line from Winnfield to Jena is not yet open for traffic, so that the mileage in operation is 147.7 miles. Two extensions are projected; one from Jena east to Natchez, Miss., 47 miles, and the other from Packton, La., south to Alexandria, 36 miles.

LOUISIANA & NORTHWEST.—See Southwestern Railroad.

*LOUISIANA CENTRAL.—Grading has been begun on this proposed road from Monroe, La., south to New Iberia, 180 miles, by the Louisiana Construction Co. G. W. Decker, Newport, Ark., is President.

LOUISIANA EAST AND WEST.—Proposed road from Hesmer to Eunice, La., 51 miles, passing through Bunkie, Black Lake, Ville Platte and Mamon. W. D. Haas, Bunkie, La., is President.

*LOUISIANA RAILWAY & NAVIGATION.—Contract reported let to J. M. White, of New Orleans, for grading this company's line from Baton Rouge to New Orleans, 77 miles, and from Baton Rouge to Shreveport, 30 miles. Work to be begun at once.

*LOUISIANA ROADS (Electric).—The city of Monroe, La., is reported to have made a contract with the Western Electric Co. for the construction and equipment of an electric road seven miles long to be operated by the city; work to be finished in August.

LOUISIANA ROADS.—The Louisiana & Pacific and the De Ridder & Eastern Railroad Companies have been incorporated in Louisiana. Both are logging roads and are owned by the Long-Bell Lumber Co., of Kansas City.

——*The Crowell & Spencer Lumber Co., of Longleaf, La., is reported to have let a contract to W. E. Wilburn, Andrew, La., for building a railroad from Longleaf to Lecompte, 12 miles. Grading now in progress. Contract calls for the completion of the line by August 1, 1905.

——Proposed road from Cypress Station, in the southeastern cornor of Arkansas, on the St. Louis, Iron Mountain & Southern, southeast to Delta, La., on the Mississippi River, 70 miles.

*LOUISIANA SUGAR BELT.—Proposed line from Thibodaux, La., in a southerly direction for a distance of 40 miles. Grading has been begun; the company also proposes an extension to Grand Isle. G. R. Turner, New Orleans, La., is President.

*LOUISVILLE & NASHVILLE.—Proposed construction work in 1905 includes the tunnel at Tumlin Gap through Blount Mountain and a branch known as the Pennington Gap line, connecting with the Cumberland Valley Division at Pennington, Va., and extending up Powell's River to coke lands of the Black Mountain Coal & Coke Company, seven miles of which is graded and track laying is in progress.

——Proposed extension of the Birmingham, Selma & New Orleans division between Myrtlewood, Ala., the present terminus, and the Tombigbee River.

——This company, it is reported, has bought a right of way into Atlanta, Ga., from Kennesaw.

——*Contract let to Eddington, Griffith & Gronner, of Knoxville, Tenn., for building a 10-mile extension of the Norton branch from Artemus, Ky., to the mines of the Cumberland Coal Co.

——See Atlanta, Knoxville & Northern.

*LOWVILLE & BEAVER RIVER.—Proposed road from Lowville, N. Y., to Croghan, 11 miles. Two miles of track laid. J. T. Campbell, of Lowville, is the contractor. Location surveys have also been completed for a line from Page to Monteola, five miles. J. B. Browneli, Lowville, N. Y., is Chief Engineer.

*LUXORA, EVENING SHADE & NORTHWESTERN.—Contraact for grading the first 10 miles of this road reported let to H. P. Liston, of Luxora, Kan. The road is projected to run through Mississippi, Craighead and Sharp counties, all in Arkansas. J. B. Driver, Luxora, is President, and M. W. Connelly is Secretary.

LYONS BELT RAILROAD.—Incorporated in Illinois, with headquarters at Chicago, to build from Lyons southwest to Proviso, in Cook County, five miles. W. S. Joslyn, F. F. Heck and F. C. Schultz, of Chicago, are incorporators.

M

McKEESPORT & CLAIRTON CONNECTING.—New line from a point in the city of McKeesport, Pa., via Port Vue to Clairton, Allegheny County, Pa., 4 miles. All franchises and rights of way secured. Grading to begin this month. J. D. O'Neil, McKeesport, is President.

McRAE & DUBLIN.—Proposed line in Georgia from Dublin south to McRae, 25 miles. The road will connect with the Southern at McRae and with the Macon, Dublin & Savannah, at Dublin. One mile of track laid last year. G. M. Wilcox, Dublin, Ga., is interested.

MANCHESTER, DORSET & GRANVILLE.—Proposed line from Manchester, Vt., via Dorset to Granville, N. Y., 21 miles. Completed as far as Dorset, 8 miles. Work may be resumed this year. O. W. Norcross, of Worcester, Mass., is President.

MANILLA & SOUTHWESTERN.—Incoroprated in Arkansas to build from Manilla, in Mississippi County, to Culberhouse, Craighead County, Ark., 24 miles. W. B. Smith, of Manilla, Ark., is President.

*MANISTEE & GRAND RAPIDS.—Extension from the present terminus about 1½ miles east of Dighton, Mich., east to Marion, 10 miles. Contract let to B. F. Brucker, of Saginaw, Mich. Location surveys in progress for a further extension from Marvin to Gladwin. E. W. Muenscher, Manistee, Mich., is Chief Engineer.

MANITOWOC, GREEN BAY & NORTHWESTERN (CHICAGO & NORTH WESTERN).—Incorporated in Wisconsin to build a cut-off of the Chicago & North Western from Manitowoc northwest through Eland Junction to Gillett, 125 miles.

MARIN SHORE RAILROAD.—Proposed line in California from San Rafael in a northerly direction to Point Pedro and thence to Ignacio, 20 miles. J. A. McNear and G. P. McNear, of Petaluma, Cal., are incorporators.

MARION COUNTY.—Incorporated in Arkansas to build from Yellville east to the mouth of Buffalo River, 25 miles, where a connection can be made with the Iron Mountain. J. C. Smith, Thomas Combs and J. E. Williams, of Little Rock, are directors.

MARLINGTON & CAMDEN.—Chartered in West Virginia to build from Marlington northwest to Camden-on-Gauley, 30 miles. G. H. Campbell, Kane, Pa., and J. N. Campbell, Warren, Pa., are incorporators.

MARTINS CREEK & RIVERTON.—Proposed line from Martins Creek, Northampton County, Pa., to the intersection of the Bangor & Portland and the Pennsylvania at Bridge. R. A. Montgomery, Lambertville, N. J., is President. (Mar. 11, 1904.)

MARYLAND & PENNSYLVANIA.—Branch from Conowingo, Cecil County, northeast to Bynum, Md., 10 miles. Surveys made. T. H. Ward is Chief Engineer, and J. S. Norris, Baltimore, Md., General Manager. (Mar. 11, 1904.)

MARYSVILLE & SUSANVILLE.—Articles of incorporation filed in California to build from Marysville to a point in the Honey Lake Valley near Susanville, and from Susanville to a point on the boundary line between California and Nevada. The total length of the line is approximately 200 miles. The authorized capital is $7,000,000. Names of incorporators not given.

MASON & OCEANA.—This road, which is in operation from Buttersville, Mason County, Michigan, on Lake Michigan, southeast to Maple Range, 38 miles, is to be extended through the Crystal Valley to Hesperia. Rights of way secured and the line has been graded for a few miles out of Hesperia. Work to be resumed this year. M. F. Butters, Buttersville, Mich., is President.

MASSACHUSETTS ROADS (Electric).—Proposed electric line to connect Westfield, Mass., with Lee, 30 miles; work between Westfield and Huntington to be begun early this spring.

MAYWOOD & SUGAR CREEK.—Incorporated in Missouri to build from Maywood, on the Kansas City Southern, to a connection with the Atchison, Topeka & Santa Fe, 2 miles. T. T. Crittenden and W. J. Clark are incorporators.

MEADVALE & SOMERVILLE.—This road is reported to have been built for a distance of 10 miles from Strange Creek, W. Va., and it is to be extended 10 miles further.

MEDFORD & CRATER LAKE.—Incorporated in Oregon to build from Medford, on the Southern Pacific, east to Crater Lake, 30 miles.

MEMPHIS, INDIANOLA & GULF.—Proposed road from Memphis, Tenn., via Indianola, Dockery, Yazoo City and Jackson, Miss., to Gulfport, 450 miles. Preliminary surveys completed. Reported that contracts are to be let at once for building from Indianola to Dockery, 25 miles. W. E. Ringold, Lyon, Miss., is President, and R. Craig Heathman, Miss., Chief Engineer.

MEMPHIS & SHREVEPORT.—Incorporated in Louisiana to build from Shreveport northeast through Minden, La., to Homer, 45 miles. A. K. Clingman, Homer, La., is President, and S. G. Webb, Minden, La., is Secretary. (Mar. 11, 1904.)

MEMPHIS, INDIANOLA & GULF.—Surveys reported in progress for this proposed railroad from Memphis, Tenn., through Indianola, Miss., to Jackson. J. H. Baker, Indianola, is interested.

MEMPHIS, PARIS & GULF.—New line projected from Memphis, Tenn., through Little Rock, Ark., to Paris, Tex., about 400 miles. J. W. Brown, Camden, Ark., is President, and C. C. Henderson, Arkadelphia, Ark., is General Manager.

*MENA, HOT SPRINGS & EASTERN.—Proposed road from Mena, Ark., via Black Springs to Hot Springs, 85 miles. Work now in progress by the Arkansas Exploration Co. W. A. Carroll, Mena, Ark., is President.

MENDOTA, OTTAWA & EASTERN.—New line from Mendota, Ill., southeast to Ottawa, 20 miles. Surveys finished and rights of way secured. W. J. Perkins, Troygrove, Ill., is interested. (Mar. 11, 1904.)

MENTOR SOUTHERN.—Proposed line in Tennessee from Mentor to McGehee, running through Blount, Loudon and Monroe counties, a distance of 20 miles. W. H. Oliver, J. B. Wright and J. H. Frantz are interested. Said to be a project of the Atlanta, Knoxville & Northern.

METEOR MOUNTAIN.—Incorporated in Arizona to build from Dennison, Ariz., on the Atchison, Topeka & Santa Fe, in a southerly direction to the mines of the Standard Iron Co., 40 miles, with a branch line from Sunset southeast to the mines of the same company, 10 miles. E. B. Knox and B. L. Clark, of Dennison, Ariz., are incorporators.

*MEYERSDALE & SALISBURY (Electric).—Incorpoated in Maryland to build an electric railroad from Garrett, Pa., to Frostburg, Md., 25 miles. Contract let to Thomas Deegan & Co., of Philadelphia.

MICHIGAN CENTRAL.—Reported that the Allegan division, from Homer, Mich., to Allegan, 68 miles, recently acquired by the lease of the Detroit, Toledo & Milwaukee, will be extended to Grand Haven, 25 miles.

——Application will be made at the next session of the Dominion Parliament for an act extending the time for completing the new lines of the Canada Southern.

MICHIGAN ROADS.—Logging road from Mastodon, Mich., to Pentoga, seven miles. The Hermansville Lumber Co. is interested. (Mar. 11, 1904.)

——The Lakewood Lumber Company is about to build from Cheboygan, Mich., to Pellston, 20 miles. O. J. Smith, Lakewood, may be addressed. (Mar. 11, 1904.)

——The Cleveland Cliffs Iron Co., of Marquette, which has made large purchases of timber lands from Hall & Munson, of Bay Mills, will, it is reported, build a railroad between Munising and Bay Mills, 100 miles, through timber and agricultural lands. Both of the last-named places are on the Duluth, South Shore & Atlantic.

MIDDLEBROOK & GRANITEVILLE.—Incorporated in Missouri to build from a point above Middlebrook, on the St. Louis, Iron Mountain & Southern, to Graniteville, 3 miles. W. R. Allen, Jr., and S. T. Walsh, Graniteville, Mo., are incorporators. (Mar. 11, 1904.)

MIDDLE CREEK & GAULEY.—Chartered in West Virginia to build from the mouth of Middle Creek, Clay County, south to Gauley, 20 miles. H. S. Cato, Samuel Stevenson and R. G. Quarrier, all of Charleston, W. Va., are interested. (Mar. 11, 1904.)

MIDDLETOWN & CECILTON.—Work has been begun on this road, projected to run from Middletown, Del., southwest to Cecilton, Md., 10 miles. W. B. Davis, Samuel Hurlock and W. R. Polk, of Wilmington, Del., are interested.

MIDDLESBORO MINERAL.—New line from Middlesboro, Ky., to Harlan, 30 miles. Rights of way secured and work will shortly be begun. Henry Fonde, Knoxville, Tenn., is interested. (Mar. 11, 1904.)

MIDLAND PACIFIC.—New line from Bakersfield, Cal., via Sunset, Cuyama, Santa Maria, Guadalupe, Pismo and the Sunset oil district, to Port Harford, on the Bay of San Luis Obispo, 140 miles. Grading completed for 10 miles. Financing of rest of the line under way. Mark McDonald, A. Fiest and I. E. Blake, San Francisco, Cal., are interested.

*MIDLAND VALLEY.—Extension from Tulsa, Ind. T., via Skiatook to Pawhuska, Okla. T., 50 miles, under contract to Kahman & McMurray, Kansas City. Section from Tulsa to Skiatook, 15 miles, practically completed, and work under way from Skiatook to Pawhuska.

MILL CREEK & ADDISON.—Chartered to build from Mill Creek, Randolph County, W. Va., to Addison, 30 miles. The incorporators are W. H. Cardwell, E. W. Nealey, R. H. Avey, Jr., and Buchanan Schley, all of Hagerstown, Md. (Mar. 11, 1904.)

MILLERS CREEK.—Incorporated in Kentucky to build a railroad 16 miles long up Johns Creek, in Johnson County. Names of incorporators not given.

MILWAUKEE & STATE LINE.—Incorporated in Wisconsin to build from the city of Milwaukee through Milwaukee, Racine and Kenosha counties to the State line. Charles L. Lowe and John

FOR CULVERTS UNDER RAILROADS

whether in

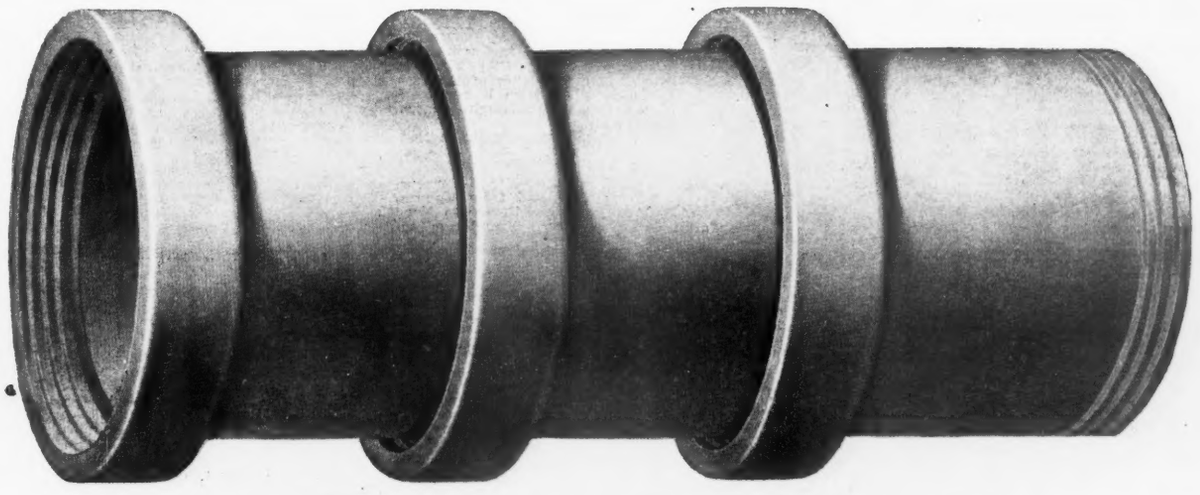
REPAIRS,
REPLACEMENTS,

or

NEW CONSTRUCTION,

our

DOUBLE STRENGTH VITRIFIED PIPE



Is generally preferred, because no other material so well unites the qualities of

UTILITY,
DURABILITY AND ECONOMY

MADE IN SIZES 12 TO 36 INCHES IN DIAMETER;

12 to 24 inch, 2½ Foot Lengths; 27 to 36 inch, 3 Foot Lengths; with

CORRUGATED DEEP SOCKETS

Write for Pamphlet showing examples of Vitrified Pipe Culvert Construction in Modern Railroad Practice.

Blackmer & Post Pipe Co.

ST. LOUIS, U. S. A.

M. Mariga, of Chicago, are incorporators. Reported to be organized in the interests of the Chicago & North Western.

MINNEAPOLIS, RED LAKE & MANITOBA.—Incorporated in Minnesota, to build from Lower Red Lake, in Beltrami County, to a connection with the Minnesota & International in the same county. C. A. Smith, and others, of Minneapolis, are incorporators.

MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE.—Work will be begun in the spring on an extension from Thief River Falls, Minn., west across the Red River Valley to Kenmare, N. Dak., on the present western main line of the road, 291 miles.

MINNEKAHTA & RED CANON.—Incorporated in South Dakota, to build a line, six miles long, in Fall River County. G. A. Clark and C. J. Patton, of Keystone, S. Dak., are interested. (Mar. 11, 1904.)

MINNESOTA & GREAT NORTHERN (GREAT NORTHERN).—Incorporated in Minnesota to build from Pelican Rapids, Minn., north through Ottertail, Norman and Polk into Roseau County. L. W. Hill, R. A. Wilkinson and other Great Northern officers are incorporators.

*MINNESOTA & INTERNATIONAL (NORTHERN PACIFIC).—This company, whose road runs from Brainerd, Minn., north via Bemidji to Northome, 132 miles, is reported to have let to A. Guthrie & Co., of St. Paul, a contract for building a 30-mile extension north from Northome.

*MINNESOTA CENTRAL.—A contract has been awarded to Drake, Marker & Co., Philadelphia, for building this new line from Mankato, Minn., northeast through Gaylord, Litchfield and St. Cloud to Duluth, about 200 miles. C. H. Mackenzie, Gaylord, Minn., is Secretary, and D. H. Beecher, Grand Forks, N. Dak., is President.

*MINNESOTA ROADS.—Contract let to Halverson & Carlson, of Minneapolis, for building a new railroad from the present terminus of the line of the Red River Transportation Co., at Nebish, Minn., to Bemidji.

——Surveys completed for a new railroad from New Auburn, Minn., south to Nicollet, 30 miles. (Mar. 11, 1904.)

MINTER CITY, SOUTHERN & WESTERN.—Application has been made for a charter for this company to build from Minter City, in Leflore County, Miss., west to Dockery, 18 miles. J. B. Kemp, G. B. McCob and E. R. Toombs, of Greenville, Miss., are interested.

MISSISSIPPI & EASTERN.—Extension from Quitman, Miss., southeast to Jackson, Ala., 140 miles. The line has recently been completed from Quitman as far as Melvin, 20 miles, and the remaining portion is under survey. Perley Lowe, Chicago, Ill., is President, and J. W. Glynn, Quitman, Miss., is Chief Engineer.

MISSISSIPPI, ARKANSAS & WESTERN.—This company, whose road is in operation from Blissville, Ark., to Vinson, 12 miles, and built to Big Bayou, proposes an extension from Big Bayou to Gaines Landing, 10 miles. A. F. COOK, Little Rock, Ark., is General Manager.

MISSISSIPPI CENTRAL.—Extension from Silver Creek, Miss., west to Brookhaven, 26 miles. Capital stock increased to finance building. F. L. Peck, Hattiesburg, Miss., is President.

MISSISSIPPI RIVER, HAMBURG & WESTERN.—This company, which operates a line between Luna Landing, Ark., and Blissville, will build an extension west to Camden, Ark., 65 miles.

*MISSISSIPPI ROADS.—Reported that a road will be built from Moss Point, Miss., on a branch of the Louisville & Nashville, north to Lucedale, on the Mobile, Jackson & Kansas City, 35 miles, by W. Denny & Co., lumber manufacturers, of Moss Point, who have let the contract for the first 15 miles.

MISSISSIPPI VALLEY.—Line to be built from Tyler to Blytheville, Ark., 10 miles. W. E. Ayres, Osceola, Ark., is Chief Engineer.

MISSOURI, ARKANSAS & SOUTHWESTERN.—This company has applied for incorporation in Arkansas to build a railroad from the Arkansas State line to Batesville, 70 miles.

MISSOURI & ILLINOIS BRIDGE & BELT.—Chartered in Missouri with an authorized capital of $2,500,000, to build from a connection with the Wabash near Ferguson, Mo., to a connection with the St. Clair, Madison & St. Louis Belt Railroad, 15 miles. Joseph Ramsey, Jr., A. J. Davidson, B. L. Winchell, M. H. Smith, James McCrea, Oscar Murray, George J. Gould, E. T. Jefferey and M. E. Ingalls are directors.

MISSOURI & IOWA SOUTHERN.—New line from Sedalia, Mo., via Marshall to Miami, 55 miles. Projected. A. L. Strang, Sedalia, is interested. (Mar. 11, 1904.)

MISSOURI CENTRAL (Electric).—Incorporated under the laws of Missouri, with a capitalization of $12,000,000, to build an electric line from St. Louis west to Kansas City, 300 miles. Most of the rights of way reported to have been secured. Bridges across the Missouri River at St. Charles and at Glasgow, Mo., will be necessary. W. H. Chase, of Toledo, Ohio, and Fulton, Mo., is President.

*MISSOURI, KANSAS & TEXAS.—Contract reported let for building an extension from Oklahoma City, Okla. T., to Wichita Falls, Tex., 184 miles.

——This company is reported to have made large purchases of land in Kansas City, Mo., for use as freight yards, in consequence of the termination of the contract by which it has used the St. Louis & San Francisco's freight houses and yards at Kansas City.

——See Granger, Georgetown, Austin & San Antonio.

——See St. Louis, El Reno & Western.

MISSOURI, KENTUCKY & VIRGINIA.—Surveys reported completed for this road from Kansas City, Mo., to Columbia, Ky., and thence to Norfolk. 40 miles under construction and grading on 160 more miles under way. S. Dobbins is Chief Engineer.

MISSOURI, OKLAHOMA & GULF.—This company, it is reported, will build 375 miles of railroad, mostly in Indian Territory, early in 1905. The company has bought and will complete the Muskogee Union, a short line connecting Muskogee, Ind. T., with the Missouri Pacific at Coretta, 12 miles north, and a projected line to Texas, 43 miles, which is graded. The new line to Texas runs from Muskogee to Henrietta, where it crosses the Frisco, thence to Spokogee, crossing the Fort Smith & Western, and thence to the Red River, which it will cross at Denison. Surveys are now in progress for an entirely new line from Muskogee northeast to Joplin. Construction will begin in April. The line from Joplin to Denison will be 310 miles long. The company has also authorized the construction of a line from Henrietta, Ind. T., a junction with the Frisco, to Shawnee, Okla., a distance of 65 miles. William Kenefick, Kansas City, Mo., is President.

*MISSOURI, OKLAHOMA & WESTERN.—Incorporated in Oklahoma, to build from Vinita, Ind. T., to Denver, Colo., via Bartlesville, Ponca City, Lamont, Pond Creek and Alva. Surveys completed from Vinita to Lamont, 200 miles, and grading finished to a point 17 miles west of Ponca City. (Mar. 11, 1904.)

MISSOURI PACIFIC.—This company is reported to be making surveys for a branch from Joplin, Mo., southwest to Muskogee, Ind. T., 120 miles; also to be preparing to build the St. Louis cut-off from Lamar, Mo., northeasterly to a point on the St. Louis & Kansas City line.

——*The White River branch, now building from Carthage, Mo., to Buffalo City, Ark., is completed from Carthage southeast to Galena, Mo., 53 miles. Between Galena and Harrison, Ark., five tunnels will be necessary, ranging from 1,100 ft. to 3,400 ft. in length, as well as numerous trestles, and it will take probably the remainder of the year to finish the line to Harrison.

——See Gurdon & Fort Smith.

——See Kansas City, Nevada & Springfield.

——See Springfield & Southwestern.

*MISSOURI RIVER & NORTHWESTERN.—This company, which is the Dakota Pacific reorganized, has let a contract for building 26 miles of its proposed line from Mystic, S. Dak., via Silver City and Pactola to Rapid City, 34.6 miles, to Willis & Detwiler. Nearly two miles of trestles will be required. Construction work is to be begun shortly.

MISSOURI ROADS.—A contract is said to have been given to the Ware Construction Co., to build a line from Lamar, Mo., northwest through Barton County to Jerico and Stockton, Cedar County.

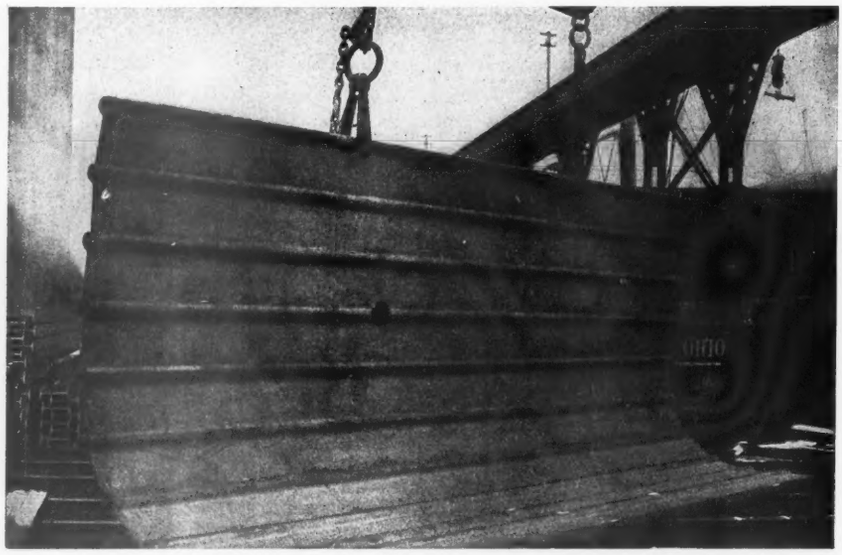
MOBILE & OHIO.—Extension of the recently completed Okolona branch from Vardaman, Miss., to Winona, Montgomery Co., where connection can be made with the Southern and the Illinois Central. Surveys reported.

Steel Sheet Piling
Simple Interlocking Absolutely Watertight

A Plain Rolled Section.

Ready for use as it comes from the mill.

No rivets, bolts or other attachments requiring repairs.



Each piece complete in itself and interchangeable.

Superior for any use to any known form of Sheet Piling.

UNITED STATES
STEEL PILING COMPANY
General Offices, 135 Adams St.
CHICAGO, ILL.

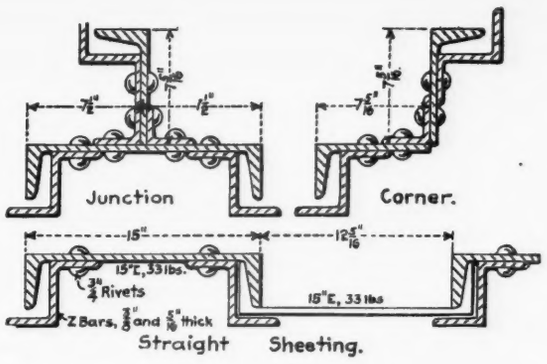
QUICK SAND

The only form of

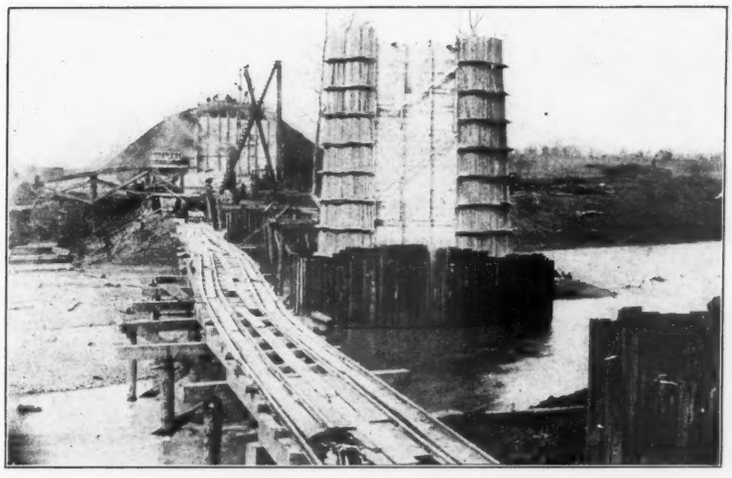
Steel Piling

that will absolutely Penetrate Quick Sand to any depth.

It is Watertight



For Mine Shafts, Coffer Dams, Sea Walls, Deep Foundation Work, Caissons, Retaining Walls, Subway Walls, Dams, Irrigation Work, Locks, Break Waters, Etc., Etc.



ABOVE PHOTOGRAPH ILLUSTRATES THREE COFFER DAMS EMPLOYED BY C., B. & Q. RY., FOR CONSTRUCTION OF BRIDGE PIERS IN THE CUIVRE RIVER AT MOSCOW MILLS, MO. SIZE, 21'x38'x32' DEEP.

Interlocking Channel Bar Piling can be repaired. This is impossible with a SPECIAL ROLL DESIGN.

When considering the purchase of STEEL PILING an answer to the following question is of vital importance:

What References Can You Give Relative to the Application of Your Piling? Where Has It Been Used, and Under What Circumstances?

We can reply to the above to your satisfaction, and have the best endorsements from railroads, contractors and engineers.

FRIESTEDT INTERLOCKING CHANNEL BAR COMPANY

INCORPORATED

1408-1412 Tribune Building, CHICAGO, ILL. **Descriptive Catalogue and Model sent upon request.**

*MOBILE & WEST ALABAMA.—Location surveys about completed for this railroad from Birmingham, Ala., southwest to Tuscaloosa, 50 miles. The work will be done by the Terry & Gahagan Construction Co., of 79 Wall Street, New York, and will include 10,560 lin. ft. of steel bridges and viaduct, and 42,733 lineal ft. of tunnels. H. Austel, Mobile, Ala., is President, and J. A. Montgomery, First National Bank building, Birmingham, Ala., is Chief Engineer.

MOBILE, COLD SPRINGS, NATCHEZ & NORTHWESTERN.—Organized in Alabama, to build from Mobile, Ala., to Natchez, Miss. E. H. Easterling, Brook Haven, Miss., is interested. (Mar. 11, 1904.)

*MOBILE, JACKSON & KANSAS CITY.—New road from Mobile, Ala., north to Jackson, Tenn., 400 miles, passing through Beaumont, Laurel, Newton, Ackerman, Houston, Pontotoc, New Albany and Middleton. Main line in operation from Mobile to Newton, 162 miles. The Gulf & Chicago, which is leased by this company, is in operation from Pontotoc north to Middleton, 62½ miles. The Gulf & Chicago has its line from Newton via Ackerman and Houston to Pontotoc, 143 miles, all graded, and track laid from Ackerman south to Noxapater, 20 miles, and from Houston north to Pontotoc, 25 miles. F. W. Johnston & Co., Bay City, Tex., have the contract for tracklaying, and the Jarrett Construction Co., of Springfield, Mo., the contract for buildings.

MOBILE, VOLANTA & PENSACOLA.—Proposed line in Alabama from Marlow, Baldwin County, Ala., southeast to Pensacola, Fla., 40 miles. Charles Barclay, Marlow, Ala., may be addressed.

MONEGAN SPRINGS.—New line from Osceola, St. Clair County, Mo., northwest through Bates County to Monegan Springs. Surveys completed. (Mar. 11, 1904.)

MONONGAHELA & WASHINGTON.—Line from a point near Ellsworth, Pa., south to a point in West Bethlehem Township, to reach the lands of the Pittsburg & Buffalo Coal Co., 16 miles. Surveys reported.

MONROE & LAKE PROVIDENCE.—Proposed line from Monroe, La., to Lake Providence, about 60 miles. Preliminary surveys reported finished. A. A. Gunby, Monroe, La., is President, and E. J. Hemley, Lake Providence, La., Vice-President.

*MONROE & SOUTHWESTERN.—Work reported in progress on this proposed railroad from Monroe, La., southwest through Winfield to Natchitoches, about 85 miles. Track laid for a distance of 15 miles out of Monroe. W. A. Brown is Vice-President and General Manager, and Robert Blanks, Secretary, both of Monroe, La.

MONROE CENTRAL.—Chartered to build through Monroe and Greenbrier Counties, in West Virginia, from a point near Peterstown through Red Sulphur Springs and Union to Ronceverte, 75 miles. Branch line proposed in an easterly direction to Sweet Springs, 32 miles. E. C. Vincent, Union, W. Va., is Chief Engineer.

MONTANA NORTHERN.—Incorporated in Montana, to build from Basin to Elliston, 25 miles. M. L. Hewitt, C. C. Darrow and E. W. Burdick, of Boulder, Mont., are incorporators.

MONTANA ROADS.—New line from Cooke, Mont., to Red Lodge, 40 miles. Surveys. B. B. Kelly, Cooke, Mont., is interested. (Mar. 11, 1904.)

MONTEVISTA & NORTHEASTERN.—Incorporated in Colorado, to build from Montevista, Rio Grande County, through Costilla, Saguache, Custa and Huerfano counties to Pueblo; also to build from Montevista through Rio Grande, Conejas, Archuleta and La Plata counties to Durango, N. M. The incorporators include Charles S. Fassitt and George W. Gates, of Montevista; W. W. Riley and C. H. Redmond, of Denver.

MOOSEHEAD RAILROAD.—Incorporated to build a narrow-gage railroad from Stratton, Me., to Flagstaff, eight miles. J. H. Barron and Fletcher Pope, Phillips, Me., are directors. (Mar. 11, 1904.)

MOREHEAD & WEST LIBERTY.—Proposed line from Morehead to West Liberty, Ky., 25 miles. Four miles were completed in 1901, and the line was then abandoned. It is stated that work will be resumed at once. E. B. Carr, West Liberty, Ky., is General Manager.

*MORGANTOWN & KINGWOOD.—Work well under way on an extension of this road from Bretz, W. Va., to Kingwood, 15 miles. Track has been laid as far as Reedsville, 2½ miles from Bretz. Talbott Bros., Reedsville, W. Va., are the contractors. Surveys in progress for an extension of the line from Kingwood to Rowlesburg, 18 miles. A. S. Brady, Morgantown, W. Va., is Chief Engineer.

MORGANTOWN & PITTSBURG.—New company in West Virginia to build from Morgantown southwest to Fairmont, 20 miles. Charter granted. C. B. Dille and David Elkins, Morgantown, and C. W. Fisher, Fairmont, W. Va., are incorporators. (Mar. 11, 1904.)

MORRIS TERMINAL.—Incorporated, with a capital stock of $50,000 and headquarters at Chicago, to build a belt railroad in the City of Morris, Ill. Charles E. Hook, Oscar Haeberle, C. P. Gardner and George T. Buckingham are incorporators.

MOULTRIE & HARTSFIELD.—Projected extension of the Georgia & Northern from Moultrie west to Hartsfield, 10 miles, under the above title. C. W. Pidcock, Moultrie, Ga., is General Manager. (Mar. 11, 1904.)

MOUNTAIN HOME.—Charter granted in Tennessee, with power to build from Cotter to Mountain Home, 11 miles. A. J. Truman and W. J. Baker, Mountain Home, Tenn., are interested. (Mar. 11, 1904.)

MOUNT AIRY & EASTERN.—Extension from the Dam River to Stuart, Va., 10 miles. Surveys reported finished. S. A. White, Stuart, Va., is Chief Engineer.

MOUNT HOOD.—Incorporated in Utah, with a capital stock of $250,000, of which $110,000 is reported subscribed, to build railroads in the States of Washington and Oregon. William H. Eccles is President; Thomas D. Dee, Vice-President, and David C. Eccles, Secretary.

MOUNT STERLING SHORT LINE.—Proposed road from Mount Sterling, Ky., through Montgomery County to Indian Fields, in Oklahoma County, where connection will be made with the Lexington & Eastern. Work to be begun soon. E. S. Jouett, Winchester, Ky., may be addressed.

MOXAHALA & BRISTOL.—Incorporated in Ohio, to build from a point near Moxahala, in Perry County, connecting with the Toledo & Ohio Central, to a point in the same county, on the Baltimore & Ohio.

*MUNISING RAILROAD.—Extension of east branch from Chapman, Alger County, Mich., 7½ miles. All graded, and 2½ miles of track laid. H. R. Harris, Marquette, Mich., is General Manager.

N

*NACOGDOCHES SOUTHEASTERN.—Contract for building this line let to Charles McSweeny, Houston, Texas. The proposed route is from Nacogdoches to a point on the Atoyac River, 30 miles. Grading has been begun, but no track laid. E. B. Hayward, Davenport, Iowa, is President, and W. H. Kimball, Nacogdoches, Texas, is Chief Engineer.

NASHVILLE & HUNTSVILLE (Electric).—Application made in Tennessee for a charter for this road, to be part of a projected electric system from Memphis, Tenn., through Nashville, Tenn., Birmingham and Montgomery, Ala., to Pensacola, Fla. From Nashville to Huntsville, Tenn., the line will be 107 miles long, and from Huntsville to Pensacola, 315 miles long.

*NASHVILLE, CHATTANOOGA & ST. LOUIS.—This company has bought 42 acres of land five miles north of Atlanta, Ga., for a new yard. A contract is reported let to the Southern Contracting Co., for the grading.

*NATCHEZ & GULF.—Incorporated in Mississippi, to build from Natchez to Gulfport, Miss., 125 miles. Location of line completed, and contract for first section let. W. W. Hungerford, Gulfport, is Chief Engineer. (Mar. 11, 1904.)

NATCHEZ & WESTERN.—Surveys in progress for an extension from the Black River, La., to a point near Alexandria, 75 miles.

*NATCHEZ, COLUMBIA & MOBILE.—Work in progress on an extension from Roonville, Miss., to the Pearl River, 7½ miles; 2½ miles completed last year. R. B. Butterfield, Northfield, Mass., is General Manager.

NAUGATUCK VALLEY (Electric).—Organized to build from Naugatuck, Conn., through Beacon Falls to Seymour, 10 miles, paralleling the New York, New Haven & Hartford. A. W. Page, Bridgeport, Conn.; Edmund Day, Seymour, Conn., and A. D. Warner, Beacon Falls, are directors. (Mar. 11, 1904.)

*NEBRASKA, KANSAS & GULF.—Incorporated in Kansas to build from Belleville, Kan., through Cloud, Ottawa, Saline and other counties to Fort Smith, Ark. Contract for grading let to the Federal Construction Co. H. F. Reddig, Kansas City, is President. (Mar. 11, 1904.)

NELSON & ALBEMARLE.—New line from Soapstone Quarry, 10 miles south of Chatham, Va., to connection with the Southern Railway, eight miles. Charter granted. J. W. Foster, J. G. Hopkins and G. W. Bostwick, Roanoke, Va., are incorporators. (Mar. 11, 1904.)

NEVADA COUNTY NARROW GAGE.—Cut-off from Colfax, the southern terminus of the line, to Grass Valley, Cal. It is proposed to run the new line south of the present route, commencing at Chicago Park and continuing to Dutch Flat Road, where the old track will be rejoined. C. P. Lughridge, Grass Valley, Cal., is General Manager.

NEVADA MIDLAND.—Extension of Nevada Central, under name of Nevada Midland, from Austin south to Tonopah, 112 miles. No prospects of immediate building. Simon Bamberger is President.

*NEW BERLIN & WINNFIELD.—Grading begun on this proposed road from Winnfield, Pa., to New Berlin, eight miles. I. C. Burd, Shamokin, Pa., is President.

NEWCASTLE & EASTERN.—New line from Newcastle, Pa., to Rose Point, 10 miles. Charter granted. Edwin N. Ohl, Newcastle, is President. (Mar. 11, 1904.)

*NEW HOPE VALLEY.—The proposed route of this road is from New Hill, N. C., to a point near Chappel Hill, about 20 miles. Contract for building the first three miles let to Ferrel & Noe, of Pittsboro, N. C. William Montcure, Raleigh, N. C., is President.

*NEWHOUSE, COPPER GULCH & SEVIER LAKE.—Incorporated in Utah, to build an ore road from Newhouse, Beaver County, Utah, to Sevier Lake, in Millard County, 20 miles. Three and one-half miles are already in operation. Work reported in progress. Samuel Newhouse is interested.

NEW IBERIA & NORTHERN.—Organized in Louisiana, to build from a point near New Iberia, in a northwesterly direction to Natchitoches, 150 miles. (Mar. 11, 1904.)

*NEW JERSEY SHORT LINE (Electric).—This company, which was incorporated in New Jersey, has awarded a contract to the Railroad Construction Company, of Philadelphia, for building its line from Milltown through New Brunswick to Elizabeth, N. J., 36 miles. R. D. Ashbridge, East Downingtown, Pa.; A. A. Moyer, Philadelphia; T. P. Curley, G. H. P. Martin and J. H. Sintzeo, Camden, N. J., are incorporators.

NEW MARTINSVILLE & MIDDLEBOURNE.—Incorporated to build from Steelton, W. Va., via New Martinsville and Middlebourne, along the Middle Island Creek to the mouth of McElroy River, to its main fork, and thence to the town of Salem, in Harrison County, 40 miles. T. P. Jacobs and O. L. Haught, and others, of New Martinsville, are incorporators.

NEW MEXICO MIDLAND.—Incorporated in New Mexico to build a railroad 15 miles long to connect with coal fields near Carthage. Work suspended pending a decision of the U. S. Land Office. H. M. Dougherty, Socorro, N. Mex., is interested.

NEW MEXICAN ROADS.—The Phelps-Dodge Company will soon begin work on a railroad from Deming, N. Mex., through the Membres Valley to coal fields owned by the company in McKinley County, N. Mex. (Mar. 11, 1904.)

——The Colorado Fuel & Iron Co. will build from Coyote, N. Mex., to some iron mines in Socorro County, 18 miles. (Mar. 11, 1904.)

——Preliminary surveys by the Teho-Stegner Company, of Missouri, for a railroad entering New Mexico from the east, in Guadaloupe County, and leaving on the west through Socorro County into Arizona. (Mar. 11, 1904.)

NEW MEXICO & PACIFIC.—New line from Raton west to Elizabethtown, N. Mex., 80 miles. Surveys completed. O. H. Turner, Raton, N. Mex., is Chief Engineer. (Mar. 11, 1904.)

NEW ORLEANS & GULF RY. & NAVIGATION.—Incorporated in Louisiana, to buy about 500,000 acres of land between the Mississippi River and Bayou La Fourche and to develop it by building canals and railroads. W. W. Goodwin, Memphis, Tenn., and C. A. Ramsey, New Orleans, are incorporators. (Mar. 11, 1904.)

NEW ORLEANS & MISSISSIPPI MIDLAND.—This company proposes to build from New Orleans up the Pearl River Valley and through the central portion of Mississippi. Rights of way have been secured in Leake County. Surveys are reported under way. R. P. Duncan, of New York, and T. Marshall Miller, of New Orleans, are interested.

NEW ORLEANS GREAT NORTHERN.—Incorporated in Louisiana, with capital of $1,150,000, to take over the East Louisiana Railroad running from Pearl River, St. Tammany Parish, west to Covington, 24 miles, with a branch to Mandeville, 12 miles, and to build and operate a line from Slidell, La., through St. Tammany and Washington Parishes; also to make connections with the New Orleans & North Eastern, or to build independently between Slidell and New Orleans. F. H. Goodyear, of Buffalo, N. Y., is President; C. J. James, Secretary, and N. G. Pearsoll, Manager.

*NEW ORLEANS, HOUMA & NORTHWESTERN.—Proposed road from New Orleans via Houma, Morgan City and Gibson to Lone Star, Texas. A contract reported let to James Cirigliano, Gibson, La. J. A. Humphreys, Lexington, Ky., is President.

*NEW ORLEANS TERMINAL.—Plans have been approved by the officials of the Rock Island Company and the Southern Railway for the proposed joint terminal in New Orleans. It is stated that the work will involve an expenditure of about $8,000,000, and that it will take two years to complete the improvement. J. F. Hinckley, St. Louis, Mo., is Chief Engineer. James Stewart & Co., Pittsburg, Pa., contractors.

NEW PARK & FAWN GROVE.—Organized in Pennsylvania to build an extension of the Stewartstown Railroad from Stewartstown to Fawn, nine miles. The capital is to be $90,000. John H. Anderson is President, and John C. Wiley, Treasurer, both of York, Pa.

NEWPORT & SPRINGVIEW.—Organized in Nebraska to build from Newport, in Rock County, to Springview, 35 miles. M. F. Harrington, O'Neill, Neb., is President, and E. L. Myers, Newport, Neb., Vice-President.

NEW RIVER & POCAHONTAS.—Chartered in West Virginia, to build from Hinton, Summers County, to Dents Creek, Raleigh County, 10 miles. Arthur Dunn, Scranton, Pa., is interested.

*NEW YORK & JERSEY (HUDSON RIVER TUNNEL).—This company's south tunnel under the Hudson River is now 75 per cent. completed. The north tunnel was driven through last March. Work is also progressing rapidly on the excavations leading to the terminal at Greenwich St. The tunnel may be finished this year.

NEW YORK & NEW JERSEY RAPID TRANSIT.—Incorporated in New Jersey, with a capital of $200,000, to build an elevated electric railroad from a point on the west shore of the Hudson River near the Weehawken ferry of the West Shore, through Hudson, Bergen and Passaic counties to Paterson, 13.6 miles.

NEW YORK & PORTCHESTER (Electric).—This company proposes to build a railroad from the Harlem River at or near 129th Street, New York City, northeast to the Connecticut State line at Port Chester. At present engaged in litigation with New York, Westchester & Boston, which proposes to build a similar road.

NEW YORK, AUBURN & LANSING.—This company, which proposes to build from Auburn, N. Y., south to Ithaca, 32 miles, is reported to have applied to the New York State Railroad Commissioners for authority to issue a mortgage of $1,000,000, and for permission to cross the tracks of the Lehigh Valley.

NEW YORK CENTRAL & HUDSON RIVER.—This company is making surveys of the country between Chatham and Springfield on the north and some point in the vicinity of Brewsters or Golden's Bridge, on the Harlem division, on the south, to determine whether a line connecting with the Boston & Albany at some point between Chatham and Springfield is practicable.

——It is the purpose of this company to extend the double tracking of the Harlem division, which is finished to Golden's Bridge, 44 miles from New York, so as to get another double track line between New York and Albany by use of a part of the Boston & Albany.

——Between 15 and 20 new tracks will probably be built at the Minoa end of the DeWitt freight yards.

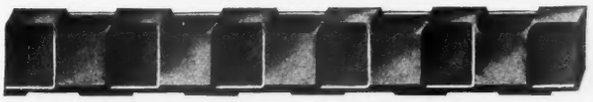
——*Depression of tracks in the Grand Central yards. Work in progress.

——*Contract let to Charles A. Sims & Co., of Philadelphia, for riprapping the embankment of the Harlem division within the limits of the Croton watershed and between Bedford and Croton Falls, N. Y.

——See Boston & Albany.

——See Cherry Tree & Dixonville.

NEW YORK CITY ROADS.—Arbuckle Bros. are reported to be back of a plan to build a termina!



THE CORRUGATED STEEL BAR

FOR STEEL CONCRETE WORK WAS GIVEN HIGHEST AWARD

GOLD MEDAL

BY THE SUPERIOR JURY

LOUISIANA PURCHASE EXPOSITION

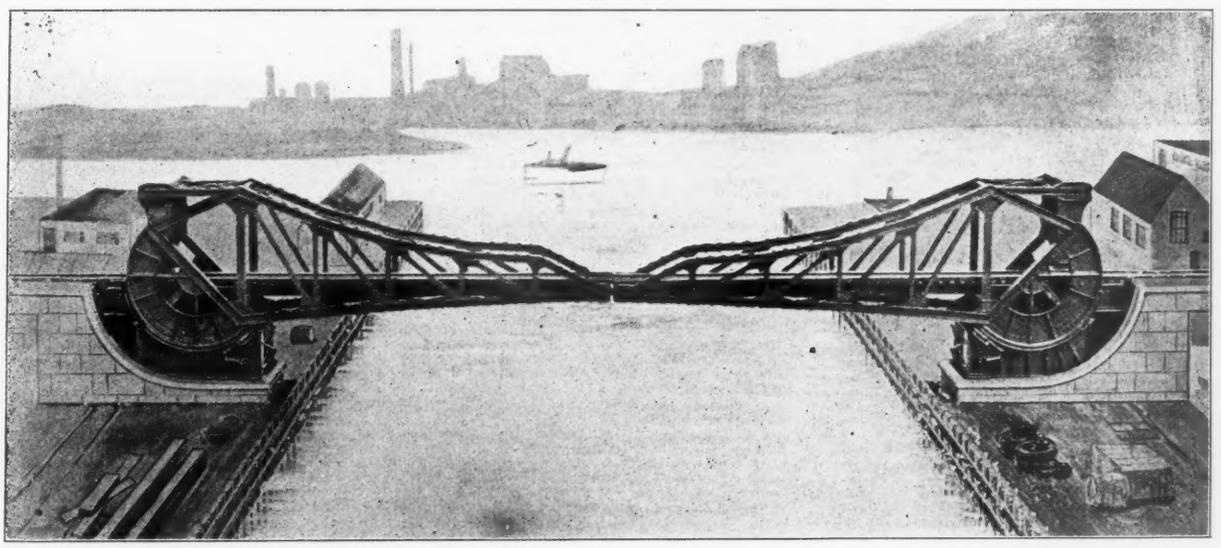
SEND FOR 1905 CATALOGUE—DESIGNS FURNISHED FREE OF CHARGE

ST. LOUIS EXPANDED METAL FIREPROOFING CO.

CENTURY BUILDING GENERAL AGENTS ST. LOUIS, U. S. A.

JOHN P. COWING, CONTRACTING ENGINEER

426 CITIZENS BUILDING
CLEVELAND, OHIO



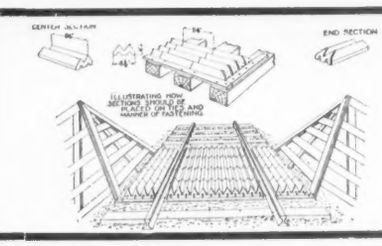
The Cowing Patent Lift Bridge, now being built at Jefferson Street, Cleveland, Ohio. Received highest award for lift bridges at the Universal Exposition at St. Louis, 1904

THIS bridge represents the most modern type of Lift Bridge, and has many special features. Uniform distribution of the moving load on the foundations. Roller bearings. Roller automatic center lock. Both leaves operated from one operator's house. Tail pits and approach spans eliminated. Plans and Estimates Furnished.

The Cowing Patent Engine Turntable Center Received the Highest Award at the Universal Exposition at St. Louis, 1904

Turntables from 50 to 85 feet furnished on short notice

JOHN P. COWING, Contracting Engineer, 426 Citizens Bldg., CLEVELAND, OHIO



The Climax Cattle Guard

Manufactured of **SHALE CLAY**

Will not burn, warp, rust or decay, will last longer, look better and cost less than any other.

The Climax Stock Guard Co.

504 Title and Trust Bldg. CHICAGO, ILL.

at the foot of Jay and Bridge Streets, in Brooklyn. It is the intention to run a network of several miles of tracks.

NEW YORK CONNECTING.—The New York City Rapid Transit Commission has granted this company a franchise to build a viaduct railroad through Long Island City to the East River at a point opposite Ward's Island, and thence by means of a bridge to pass across Ward's and Randall's Islands to a connection with the New York, New Haven & Hartford. The capital stock is held jointly by the Pennsylvania and the N. Y., N. H. & H. companies.

NEW YORK, NEW HAVEN & HARTFORD.—Construction work is now being carried on by this company as follows:

——*Bridgeport passenger station, expected to be completed this summer.

——*Elimination of Grade crossing in Fall River, practically completed.

——*Additional second-track on the Naugatuck division. Work in progress. J. J. O'Brien Contracting Co., Seymour, Conn., contractors.

——*Second tracking of Highland division from Stormville to Towners. Under way. C. W. Blakeslee & Sons, New Haven, Conn., and John W. Daly & Co., New Rochelle, N. Y. contractors.

——*Yard facilities, new engine house, coaling plant, etc., at Midway, Shore Line division. Practically completed. Horton & Hemenway, contractors.

——*Two large brick freight houses under contract for erection in Hartford. Horton & Hemenway, contractors.

——*New double-track steel bridge over Connecticut River at Warehouse Point, Hartford division. To be completed in the spring. Daly & Holbrook, contractors for substructures, and American Bridge Co., contractors for superstructures.

——*New four-track steel bridges on the New York division. In course of erection at Cos Cob, Westport and Housatonic River. Daly & Holbrook, contractors for substructures, and Passaic Steel Co. and Pennsylvania Steel Co., contractors for superstructures.

——*The Harlem River branch from Harlem River to New Rochelle, N. Y., at present double track; to be six-tracked. Contract let to New York Contracting & Trucking Co. Four of these tracks will be equipped electrically with the third-rail system. Estimated cost of the entire work on this branch, $7,701,891; $4,825,891 for the roadway and stations, and $2,876,000 for the electrical equipment and apparatus.

——Double tracking of Highland division from Towners, N. Y., southeast to Danbury, Conn., 16 miles. Proposed.

——Double tracking of the Berkshire division from New Haven west to Derby, 11 miles. Proposed.

——The Connecticut State Railroad Commissioners have approved the plans of this company for widening its roadbed from New Haven to Cedar Hill, 1.65 miles, so that it will accommodate four tracks instead of two, as at present. Estimated cost, $1,000,000.

——Surveys reported over the route of the old Ridgefield & New York Railroad for a line from some point in the vicinity of Greenwich, Conn., up the valley of the Mianus River through Northcastle and Bedford, N. Y., to Ridgefield and Danbury, Conn.

——See New York Connecting.

*NEW YORK, ONTARIO & WESTERN.—Double-tracking of the line between Cornwall, N. Y., and Cadosia, 107 miles. Work completed for a distance of 70.22 miles. I. M. Luungton, Rochester, N. Y., contractor.

*NEW YORK, PENNSYLVANIA & SOUTHWESTERN.—New name of the Binghamton & Southern, which was chartered to build a railroad from Williamsport, Pa., northeast, via Montoursville, Hills Grove, Camptown, Stevensville, St. Josephs and Vestal, to Binghamton, N. Y., 116 miles. Contracts for building the line let to Rogers & Co., 15 Wall Street, and the Colonial Construction Co., 141 Broadway, New York City. The maximum curvature is to be 8 deg. and the maximum grade 1 per cent. There will be a large number of bridges, one tunnel and one long steel viaduct. D. E. Baxter, 277 Broadway, New York, is General Manager.

——*A sub-contract for grading 15 miles of this road from Wyalusing, N. Y., northeast has been let by the original contractors, the Colonial Construction Co., to Allen, Donnelly & Co., of Easton, Pa.

NEW YORK-PHILADELPHIA COMPANY (Electric).—Articles of incorporation filed in New Jersey, to build trolley lines to shorten the distance by trolley between Camden and Jersey City. The capital is $4,000,000, and the incorporators include A. N. Chandler & Co., and H. D. Long, of Philadelphia, and Normay Gray, of Camden, N. J.

*NEW YORK RAPID TRANSIT.—Work under way at Joralemon Street, Brooklyn, on the Manhattan-Brooklyn tunnel. The proposed route of this line is from a connection with the existing subway at the intersection of Broadway and Park Row, Manhattan, southward to the Battery, and thence eastward under the East River, and under Joralemon and Fulton Streets to the Flatbush Avenue Station of the Long Island R. R., Brooklyn. The entire line must be completed by 1907, according to the contract.

NEW YORK SUBWAYS.—Plans have been submitted to the Rapid Transit Commissioners by Chief Engineer William Barclay Parsons for an expenditure of $49,000,000 for new subway lines in the city of New York. Of this amount, $40,000,000 is proposed to be expended on new lines in Manhattan, one on the east side from the Battery to the Bronx, and one on the west side from the Battery to Forty-second Street; the remaining amount, $9,000,000, to be spent in extending the present subway system in Brooklyn and in the Bronx. Included in these plans is an extension to Van Cortlandt Park and Mt. Vernon.

NEW YORK, TEXAS & MEXICAN (SOUTHERN PACIFIC).—Extension from Hawkinsville to Velasco, Tex., 21 miles. Projected. (Mar. 11, 1904.)

NEW YORK, WESTCHESTER & BOSTON (Electric).—The Board of Aldermen of New York City has approved the franchise asked by this company, which proposes to build from the Harlem River, at or about 129th Street, northeast to the Connecticut line at Port Chester, and a branch from Pelham to White Plains, 13 miles, and one to Throgg's Neck, six miles. The President of the company is William L. Bull, of Edward Sweet & Co., New York. The company intends to bid for the construction and operation of the proposed East Side subway, from the lower end of Manhattan northward through Lexington Avenue to the Harlem River. Control of this would enable the company to run trains through from its northern termini to the Battery.

NIAGARA TRANSFER.—New line incorporated in New York, to build from Buffalo to Tonawanda, 10 miles. Maps filed of proposed route. John C. Conway, Buffalo, is interested. (Mar. 11, 1904.)

NICHOLS & NORTH PENNSYLVANIA.—Chartered in New York to build a steam railroad three miles long from Nichols, Tioga County, to the Pennsylvania State line. (Mar. 11, 1904.)

*NORFOLK & WESTERN.—Work now in progress on the Iaeger & Southern branch from Iaeger, W. Va., up the Dry Fork branch of the Tug River to reach the coal and coke fields of the Berwind-White Coal Mining Co., 29½ miles.

——*Work in progress on the Big Creek branch to a point in Tazewell County, Va., 6.2 miles.

——*Work in progress on the Radford branch extension from present terminus to Little and New Rivers in Montgomery County, Va., 3.6 miles.

——This company is reported to have made extensive purchases of land in South Norfolk, Va., to be used for new yards.

——Branch line from Williamson to the coal fields on the opposite side of the mountain from the Buffalo Creek Road. Location surveys. (Mar. 11, 1904.)

NORLINA, WARRENTON & CAROLINA CENTRAL.—New line from Norlina, N. C., through Warren, Franklin, Washington and other counties to a connection with the Atlantic Coast Line at Chadburn, 150 miles. Charter granted. (Mar. 11, 1904.)

NORTHAMPTON CENTRAL.—Chartered in Pennsylvania, to build from Bath to Nazareth, 12 miles. J. S. Moyer, Bethlehem, Pa., is President. (Mar. 11, 1904.)

NORTH & SOUTH ARKANSAS.—New line from Smithville, Ark., through Ravenden and Ravenden Springs to the Missouri State line, 35 miles. Surveys in progress, and contracts for grading will soon be let. J. E. Polly, Ravenden Springs, is Chief Engineer, and M. H. Long, Imboden, Ark., Secretary. (Mar. 11, 1904.)

NORTH BRANCH TERMINAL.—Incorporated in Illinois, to build a railroad four miles long, from Lincoln Avenue, Chicago, north to Oakley Avenue, and to the north branch of the Chicago River. B. F. Weber, J. W. Turner, G. F. Goldman and P. O. Stensland, of Chicago, are incorporators. (Mar. 11, 1904.)

NORTH CAROLINA ROADS.—The Cape Fear Lumber Co., of Wilmington, N. C., is reported to be about to build a narrow gage logging road from Richardson's Crossing to Clarkston on the Seaboard Air Line, 15 miles.

NORTH DAKOTA ROADS.—Proposed line eight miles long connecting the mines of the Pembina Portland Cement Company with the Great Northern at Hensal, N. Dak. A line will eventually be built to Red Lake Falls, Minn., to connect with the extension which is being built north from Glenwood, Minn., by the Minneapolis, St. Paul & Sault Ste. Marie.

NORTHEAST TEXAS.—Work will soon be begun on the remaining 40 miles of this road between Red Water, Tex., and Texarkana. The line is completed for a distance of 14 miles from Red Water south to Daingerfield. It is intended ultimately to extend the line to Houston or Galveston. G. Munz, Red Water, Tex., is President, and R. E. Gray is Chief Engineer.

NORTHERN ALABAMA.—Two-mile spur from a point on the main line between Sheffield, Ala., and Parish, to property of the Towley Mining Co. Notice filed of intention to build.

NORTHERN & SOUTHERN ILLINOIS.—Chartered in Illinois, to build from Central, Marion County, through the counties of Marion, Jefferson, Franklin, Perry and Williamson to Herrin, Williamson County. The principal office will be in Chicago. Dwight Lawrence, T. P. Sheldon and C. A. Folsom, all of Chicago, are incorporators.

NORTHERN MAINE SEAPORT.—This company has been granted a charter to build from La Grange, on the Bangor & Aroostook, to a connection with the Maine Central at Belfast, with branch lines to Stockton Springs and Searsport, a total distance of about 60 miles. F. W. Cram, Bangor, Me., President of the Bangor & Aroostook, is one of the incorporators.

NORTHERN MICHIGAN.—New line between St. Ignace, in Mackinac County, Mich., and Sault Ste. Marie, in Chippewa County, 50 miles. Projected. A. L. Robinson is Chief Engineer. (Mar. 11, 1904.)

NORTHERN PACIFIC.—Extension of Carrington branch from Denhoff, N. Dak., north to Turtle Lake. Projected.

——Twelve-mile extension from the present terminus of the Yacolt branch at Yacolt. Surveys completed. (Mar. 11, 1904.)

——See Minnesota & International.

NORTH STATE RAILROAD.—Incorporated in North Carolina to build from Johnston's Mill to a point in Harnett County, 10 miles. J. L. Brown and K. B. Johnston, of Cardenas, N. C., are incorporators. (Mar. 11, 1904.)

NORTHWESTERN & GULF.—Incorporated in Springfield, Ill., to build from Centralia, Ill., southeast to Shawneetown, 80 miles.

NORTHWESTERN RAILROAD.—Chartered in Oklahoma Territory, to build from Elk City through Day, Woodward and Beaver counties, with a branch to the south fork of the Red River. The incorporators are E. C. Neiss, E. F. Krause, and A. F. Colgren, of Chicago, and W. F. Pierce, of Elk City, Okla. Ter.

NORWOOD & ST. LAWRENCE.—Extension from Raymondsville, N. Y., to Kents Mills, 2½ miles. Surveys in progress. Building undecided. C. H. Remington, Watertown, N. Y., is President, and C. M. Getman, General Superintendent.

*NUECES VALLEY, RIO GRANDE & MEXICO.—Incorporated in Texas, to build from Aransas Pass northwest to Del Rio, on the Rio Grande, 300 miles. Contract reported let to Ward & Lee, Palestine, Tex., and work under way on 20 miles west from Artesia, La Salle County, on the International and Great Northern.

O

OAK GROVE & GEORGETOWN.—Organized in Alabama, to build from Oak Grove, Ala., northwest to Leakesville, Miss., 30 miles. M. L. Davis, Oak Grove, and J. W. Whiting, Mobile, Ala., are interested.

OAKLAND, CHARLESTON & WESTERN.—Proposed road from Oakland, Miss., southwest to Charleston, 12 miles. Connection will be made with the Illinois Central at Oakland. The offices of the company will be at Charleston. J. H. Larimer, Ingalls Building, Indianapolis, is President, and Butler Smith is Chief Engineer.

*OAKDALE WESTERN.—Proposed road between Riverbank, Cal., and Oakdale, six miles. The line will eventually be extended to Modesto, and will connect the Atchison, Topeka & Santa Fe with the Sierra Railway. W. F. Beard & Co. are the contractors.

OAKLAND & MARYSVILLE.—Incorporated in California, with an authorized capital of $4,000,000, to build from a point on the Oakland waterfront easterly to Sacramento, and thence to Marysville, 135 miles. W. B. Cope, F. W. Zelle and J. D. McKee, of Oakland, are incorporators.

*OCILLA & VALDOSTA.—New line from Valdosta, Ga., via Nashville, Alapoha, Ocilla and Broxton to Helena, 90 miles. Line from Ocilla to Broxton, 25 miles, under contract to Robert Talmadge. Grading completed and track laid from Ocilla to Osierfield, 10 miles. Line from Broxton to Hazelhurst, 35 miles, surveyed and grading to be begun at once. No connection with the Ocilla, Pinebloom & Valdosta. J. J. Walker, of Ocilla, Ga., is Attorney for the road.

O'CONNELL RAILROAD.—New line from Gallagherville to Coatesville, Pa., four miles. Surveys in progress. T. E. O'Connell, West Chester, Pa., is President, and C. B. Lear, Jr., is Chief Engineer. (Mar. 11, 1904.)

OGDEN & NORTHWESTERN.—Incorporated in Utah, to build from Ogden to Brigham City, 20 miles. T. D. Dee is President, and H. H. Spencer, Vice-President, both of Ogden, Utah. (Mar. 11, 1904.)

OHIO RIVER & COLUMBUS.—Proposed extension from Ripley, Ohio, to Maysville, Ky., 10 miles. Grading to be begun in April.

OKAW & ST. LOUIS.—Incorporated to build through Collinsville, Troy, Saylor Springs and Robinson, Ill., to Terre Haute, Ind. Rights of way being secured, and surveys in progress. (Mar. 11, 1904.)

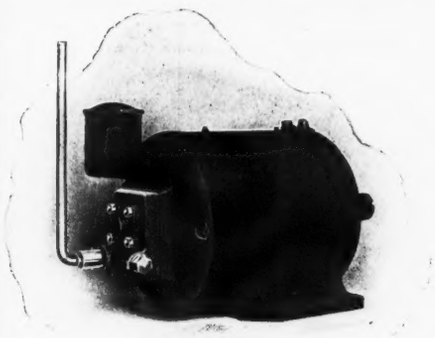
OKLAHOMA & CHEROKEE CENTRAL.—Chartered in Oklahoma, to build from a point near Adair, Ind. T., through the Cherokee and Osage reservations to Blackwell, Okla. T., 100 miles. Construction work from Pryor Creek, Ind. T., northwest to Chelsea, 20 miles, will probably

The illustration shows the trainshed of the Louisville & Nashville Railroad Union Passenger Station at 10th & Broadway, Louisville, Ky., equipped with "Granitoid" station platforms constructed by

THE AMERICAN CONCRETE CONSTRUCTION COMPANY

Cincinnati, Ohio,

under their patented construction. This Company has constructed platforms for all the large railroad systems in the country, having platforms scattered from New York to Texas and Florida. They have just finished a large contract for the Atlanta Terminal Company in the new passenger station in Atlanta, Ga.

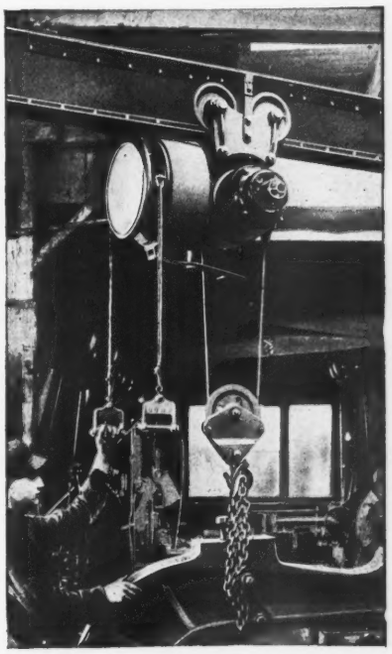


Air Motors

In almost any plant some old hand crane, derrick, winch or machine of that nature is likely to be found which the management would like to fit up to operate by power if it were not going to cost too much.

We put BACK GEARS in the case with our high speed air motor to take care of just that sort of thing. We gear it down so that the driving shaft revolves just enough faster than a man usually turns a crank to give the increased speed naturally looked for in power operated machines. We also put in a brake. This gives a self contained motor which is all ready to couple up with the gearing ordinarily in use on hand WINCHES, JIB CRANES, DERRICKS, TRAVELING CRANES, TURN TABLES, ETC. The old apparatus can be transformed so as to operate by compressed air at a very small expense, and with little trouble. If you have a complicated proposition, make use of our experience. We have helped a good many with this motor.

Electric Hoists



We combine in a simple, compact machine, all the essential details of a modern traveling Crane. There is an Electric brake to bring the load quickly to rest and a mechanical brake to hold it securely in any position and prevent its acceleration in lowering. Neither opposes any resistance whatsoever to hoisting.

SPUR GEARS RUNNING in a BATH OF OIL give it the highest possible efficiency. All gears are machine cut and of ample face and strength. All running parts are wholly enclosed and the Hoist may be used out of doors or in a dusty atmosphere without harm.

SPEED CONTROL is secured by the use of a rheostatic controller, allowing several distinct speeds, which we furnish with each Hoist.

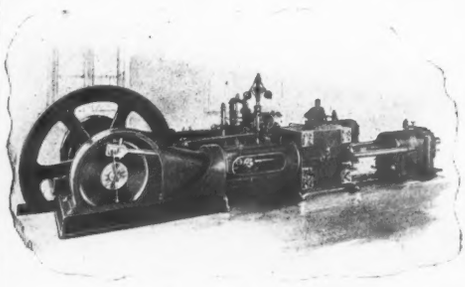
No other hoist takes as little head room

WRITE FOR BULLETIN No. 56

THE GENERAL PNEUMATIC TOOL CO.

MONTOUR FALLS, N. Y.

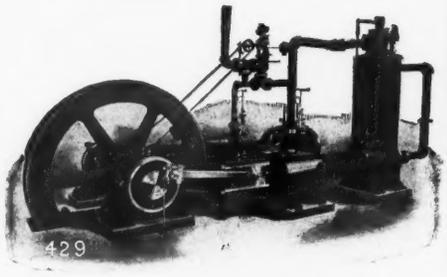
NEW YORK: 149 Broadway **CHICAGO:** P. O. Box 1046 **PHILADELPHIA:** Stephen Girard Bldg.



AIR POWER

EQUIPMENTS FOR RAILWAYS

COMPRESSORS
TOOLS



THE INGERSOLL-SERGEANT DRILL CO.

Chicago, Ill.
Cleveland, O.
St. Louis, Mo.

26 Cortlandt Street
NEW YORK

Pittsburg, Pa.
Philadelphia, Pa.
Boston, Mass.

Q25.

T. T. CRITTENDEN, JR., Pres. LEE E. MITCHELL, V.-P. and Manager. S. A. MITCHELL, Sec'y and Treas.

MITCHELL-CRITTENDEN TIE COMPANY

Tie Contractors

LARGE FACILITIES PROMPT SHIPMENTS

Operating on
Kansas City Southern Railway

Shreveport, La. Courier Bldg., TEXARKANA, TEXAS Kansas City, Mo.

begin in April. G. M. Green and C. R. Havighorst, of Guthrie, Okla. T., are incorporators.

OKLAHOMA & NORTHWESTERN.—Surveys completed, and work to begin at once on this proposed line from Coalgate, Ind. Ter., northwest to Carmen, Okla. T., 140 miles. The line will eventually be extended to Denver, Colo., 500 miles. C. G. Jones, Oklahoma City, is President.

*OKLAHOMA & TEXAS SOUTHERN.—This road, which is projected to run from a point on the Red River in Montague County, Tex., near Spanish Fort, through Nocona, Montague and Bowie, and eventually southwest to Houston, is reported to have much of its line between Nocona and Bowie, 20 miles, already graded. Among the directors are S. D. Chamberlain and E. E. Churchill, of Fort Worth, and J. F. Clark, of Montague, Tex.

OKLAHOMA CITY, HENRIETTA & ST. LOUIS.—Incorporated in Oklahoma Territory, with headquarters at Oklahoma City, to build from Woodward, Okla. T., to Oklahoma City, and thence to Checotah, Ind. T., 280 miles. The authorized capital is $3,000,000. J. A. Dibble, J. H. Wheeler, and J. W. Shortwell, of Oklahoma City, are directors.

OKLAHOMA, ROSWELL & WHITE MOUNTAINS.—Organized in Oklahoma, to build from Mangum, Okla. T., to Roswell, N. Mex., approximately 400 miles. J. W. Graves, Oklahoma City, is President, and S. A. Byers is Secretary.

OKLAHOMA SOUTHWESTERN.—Chartered in Oklahoma, to build through Custer, Day and Roger Mills counties. John Overholt, Enid, and J. A. Mays, Elk City, are interested. (Mar. 11, 1904.)

OKLAHOMA, TEXAS & GULF.—Charter filed by this company, with offices in Clarksville, Tex., to build from Wright's Landing on the Red River, in Red River County, Tex., passing through the town of Clarksville to a point north of Longview, 100 miles. It is also proposed to build from Atoka, Ind. T., to a connection with the Texas division at the Red River, 90 miles. The incorporators are: Alexander Richmond, of Muskogee, Ind. T.; J. W. O'Neil and G. J. Cheatham.

OKLAHOMA, TEXAS & NEW MEXICO.—Charter granted this company in Oklahoma Territory, with an authorized capital of $10,000,000, to build from Woodward, Okla. T., through Dalhart to El Paso, Texas. J. H. Conlen, Dalhart, Texas, is President, and W. C. Edwards, General Manager.

OLD RIVER & TRINITY.—New line from Moores Bluff, Texas, on the Trinity River, across Old River to Dayton, 10 miles. W. C. Huff and C. R. Cummings, of Houston, Texas, are incorporators. (Mar. 11, 1904.)

OMAHA & NEBRASKA CENTRAL.—Articles of incorporation filed in Nebraska, with an authorized capital stock of $11,500,000, and headquarters at Lincoln, Neb. The proposed route is from Omaha to Hastings, Neb., 155 miles. C. J. Helm and Anthony Texter are incorporators.

OMAHA & SOUTHERN.—Incorporated in Nebraska, to build from Omaha to Papillion, 15 miles. B. E. Wilcox and A. A. Tully, Omaha, Neb., are incorporators. (Mar. 11, 1904.)

*OMAHA, DECATUR & NORTHERN.—Contract for grading 16 miles of this road between Tekamah, Neb., and Decatur reported let to Clifford C. Pierce and L. F. Wakefield, of Sioux City, Iowa.

ONTONAGON & SOUTHWESTERN.—Incorporated in Michigan to build from Ontonagon in a southwesterly direction to the Presque Isle river, 40 miles. T. Nester, Detroit, Mich., is President.

OPELOUSAS, GULF & NORTHEASTERN.—Surveys in progress on this proposed road from Opelousas, La., in a northeasterly direction to Moreauville, 35 miles, with a branch southwest to Crowley, 27 miles. L. E. Littell, Opelousas, La., is Chief Engineer.

ORANGE & NORTHWESTERN—Extension from Buna, Tex., to Newton, 35 miles. Connection will be made at the latter point with the Cotton Belt. Extensions aggregating 385 miles projected, including one to Shreveport, La., 150 miles. M. L. Montanden, Orange, Texas, is Chief Engineer.

OREGON & EUREKA.—Surveys have been made for a branch line between Redwood Creek and Camp 13, 30 miles. A. B. Hammond, Eureka, Cal., is President, and C. W. Root is Chief Engineer.

——*Track has been laid on 2½ miles of the extension of eight miles from Eureka to Arcata, which will be completed this year. The work is being done by the company.

OREGON & IDAHO SHORT LINE.—Incorporated in Oregon. Is to build from a point on the Columbia river through Condon and Fossil to a connection with the Oregon Short Line near Nampa, Idaho. R. W. Baxter and F. S. Stanley, of Baker City, Ore., are incorporators.

*OREGON & PACIFIC.—New line from Grant's Pass, Ore., via Wilderville, Kirby and Takilma to Crescent City, Cal., 92 miles. Contracts let, and grading in progress. The work will include five tunnels ranging from 200 ft. to 3,200 ft. long. T. W. M. Draper, Mills Bldg., San Francisco, is Chief Engineer. (Mar. 11, 1904.)

*OREGON RAILROAD & NAVIGATION COMPANY.—Contract let to the Pacific Coast Construction Co., of Portland, to build the Condon-Arlington branch in Gilliam County, Oregon, 50 miles.

——See Washington Railroad.

OREGON ROADS.—The Grand Ronde Lumber Co., La Grange, Ore., has completed surveys for a narrow-gage logging road from Hilgard, eight miles from La Grande, up the Grand Ronde River to Perry, in the Blue Mountains, 30 miles.

*OREGON SHORT LINE.—Contract let to the Utah Construction Co. for a branch from Minidoka, Idaho, across the Snake river to Twin Falls City, 60 miles. Thirty miles has been graded and track laying is now under way. The Minidoka branch traverses lands that will be put under irrigation this year by water supplied by the Twin Falls irrigation project and it will also reach lands which will be brought under cultivation by the Minidoka Project of the United States Government irrigation works.

——Extension of the Malad branch from its present terminus at Garland, Utah, to Malad City, Idaho, about 30 miles, is contemplated and building will soon be begun.

*OREGON STATE PORTAGE RAILROAD.—Reported that the contract for building this road, which is to run from Celilo to Big Eddy, 8½ miles, has been let to Nelson & White, The Dalles, Ore. The State of Oregon to supply rails and rolling stock and the contractor to furnish the rest of the material. A coaling station, one roundhouse, one water tank, 75 tons of structural material, and 50,000 cu. yds. of embankment will be required.

OREGON TRACTION.—Proposed electric road from Portland, Ore., east to Forest Grove, 26 miles.

OREGON, WASHINGTON & IDAHO.—Incorporated in Oregon, to build from Riparia, Wash., along the Snake River in an easterly direction to Lewiston, Idaho, 55 miles. Work will be comparatively light, with a maximum grade of 15 ft. per mile, and a maximum curvature of 3 deg. Nothing being done at present. A. L. Mohler is president, and W. H. Kennedy, Chief Engineer, Riparia, Wash.

OSAGE RAILROAD.—Incorporated in Oklahoma Territory, to build from a connection with the Missouri, Kansas & Oklahoma, in the Osage Nation, northeast to a point not yet determined in the northern part of Indian Territory. (Mar. 11, 1904.)

OTTAWA, MARSEILLES & STREATOR.—New line from Ottawa, Ill., via Marseilles to Streator, 25 miles. F. B. Davidson, Marseilles, Ill., and C. Griggs, Ottawa, are incorporators. (Mar. 11, 1904.)

OUACHITA VALLEY.—Charter granted this company in Arkansas to build a railroad from Millville in a southerly direction to Locust Bayou, Calhoun County, 12½ miles. J. W. Clark and Stewart Gammill, of Millville, Ark., are incorporators.

APRIL 30

To give some idea of the simplicity, the thoroughness and the practical character of our work, and the **immediate benefits** to be gained from a correspondence course in the American School of Correspondence, we have compiled from the text-books in our Electrical Engineering course a

CYCLOPEDIA of APPLIED ELECTRICITY

2,500 sets sold before the books were ready for delivery.

A Practical Guide for Electricians, Stationary Engineers, Mechanics, Engineering Students, and All Persons interested in Electricity.

Five Volumes—2,500 Pages—Fully indexed—size of page 8x10 inches. Handsomely and durably bound in ¾ Red Morocco. Over 2,000 full page plates, diagrams, tables, formulæ, etc. Every section written by an acknowledged authority. Every volume is supplemented with a carefully prepared list of test questions.

In order to bring to the attention of those interested in electricity the character of our instruction we make the following

SPECIAL INTRODUCTORY OFFER

$1.00
On Approval
(Express Prepaid.)

We will on receipt of $1.00 send these books to your home for examination, express prepaid. Look them over and examine them at your leisure. If satisfied send us $1.00 down and $2.00 per month for eight months thereafter. Otherwise notify us and we will refund your money and send shipping directions. Should you decide before October 1st to take a full Engineering course in the American School of Correspondence you will be allowed full credit for amount paid for the Cyclopedia. **Our sole object in publishing these books is to interest the public in our correspondence courses. By enrolling in a course before October first you can get this valuable Cyclopedia, regular price $30.00, free of cost. NOTE—This special offer will be finally**

WITHDRAWN APRIL 30

SOME OF THE WRITERS

PROF. F. B. CROCKER, head of Department of Electrical Engineering, Columbia University.

PROF. WILLIAM ESTY, head of the Department of Electrical Engineering, Lehigh University.

H. C. CUSHING, Jr., Wiring Expert and Consulting Engineer.

PROF. GEORGE C. SHAAD, University of Wisconsin.

J. R. CRAVATH, Western Editor of the Street Railway Journal.

WILLIAM BOYRER, Division Engineer, N. Y. and N. J. Telephone Company.

CHAS. THOM, Chief of Quadruplex Dept. Western Union Telegraph Co.

PROF. LOUIS DERR, Massachusetts Institute of Technology.

PERCY H. THOMAS, Chief Electrician, Cooper-Hewitt Co., New York City.

A. FREDERICK COLLINS, Author of "Wireless Telegraphy."

PARTIAL TABLE OF CONTENTS

PART I.—Static and Dynamic Electricity—Primary Batteries—Ohm's Law—Wire Calculations—Electrical Measurements—Wiring for Light and Power—Electric Telegraph, including Wireless and Telautograph—Insulators—Electric Welding.

PART II.—Theory of Dynamo-Electric Machinery—Design and Construction of Dynamos and Motors—Types of Machines—Motors in Machine Shops—Storage Batteries, including Theory, Management and Types.

PART III.—Incandescent and Arc Lighting—Electric Railways, including Car Wiring, Line Construction, Third Rail and Multiple Unit Systems—Management of Dynamo—Electric Machinery—Central Station Work, including Boilers, Engines, and Electrical Machinery.

PART IV.—Theory of Alternating Currents—Construction, Types and Operation of Alternators, Transformers, Induction Motors, Synchronous Motors and Rotary Converters—Power Transmission—Hewitt Mercury Vapor Converter.

PART V.—The Telephone—Instruments—Line Construction—Switchboards—Exchanges—Operation and Maintenance—Common Battery System—Automatic Telephone—Wireless Telephony.

WM. A. GOULD, 84 Wabash Ave., Chicago, Ill., says: "I am greatly pleased with the set. It is very comprehensive, written in a clear manner, being readily understood. The type large and the illustrations are fine with details clear cut. The photographic reproductions are excellent in the highest degree, the finest I have seen of machines. No progressive engineer should be without the set."

E. T. PARDEE, Consulting Engineer, Boston Mass., says: "I am satisfied of the full value of the books even at the regular price of $30.00. The practical way in which all subjects are treated makes the set of particular value to those lacking technical understanding of the science."

W. H. FLOYD, JR., City Engineer, St. Joseph, Mo., says: "I am very much pleased with the 'Cyclopedia of Applied Electricity.' I feel sure that I shall derive much profitable information from it and that it will prove a valuable acquisition to my library."

Coupon—Cut out and mail to

American School of Correspondence, Chicago, Illinois

Gentlemen: Enclosed find $1.00 for which please send me, express prepaid, one set "Cyclopedia of Applied Electricity" on the following terms:

Books to be sent on five days' approval. If satisfactory, I agree to remit $1.00, and $2.00 per month thereafter for eight months until the special price $18.00 is paid. (Regular price $30.00.) Otherwise if I notify you within five days you will refund my money and send for the books. It is further agreed that should I take a full engineering course before October 1st with your School, I shall be allowed full credit on my course for amount paid for the Cyclopedia. —*Railroad Gazette,* March 17, 1905.

Name .....

St. and No. .....

City ..... State .....

A 200 page Bulletin giving full information in regard to our courses in Electrical, Mechanical, Steam, and Civil Engineering, Architecture, Heating, Ventilation, Plumbing and Textiles, sent on request.

AMERICAN SCHOOL OF CORRESPONDENCE

at Armour Institute of Technology, Chicago, Ill.

Laborers for Contractors

Supplied Promptly and in any desired number by

The Society for the Protection of Italian Immigrants

The Society will undertake to run labor camps and commissary stores for contractors

The Society can furnish references, among which it would name **The New York Continental Jewell Filtration Co., N. Y. City**

ADDRESS

THE SOCIETY FOR THE PROTECTION OF ITALIAN IMMIGRANTS

Maritime Building, 17 Pearl Street, New York

*OVERTON COUNTY.—Building will be begun early in the spring from a point on the Tennessee Central in Putnam County, Tenn., northeast to Livingston, 17 miles. It is proposed ultimately to extend this line through Pickett County, Tenn., to the Cincinnati Southern, about 68 miles. Justis Cox, Jr., & Co., Philadelphia, Pa., are the general contractors for the entire work. B. Armitage, Philadelphia, Pa., is Chief Engineer, and E. C. Knight, Livingston, Tenn., General Counsel and Treasurer.

*OWEN & NORTHERN.—New line from Ladysmith, on the Minneapolis, St. Paul & Sault Ste. Marie, southeast to Owen, on the Wisconsin Central, 50 miles. McIntosh Bros., 506 Pabst Building, Milwaukee, Wis., are the contractors.

*OWENSBORO, ROCKPORT & VINCENNES.—New line from Owensboro, Kentucky, northwest via Rockport, Boonville, Oakland City and Hazleton to Vincennes, 65 miles. Surveys to be completed soon. S. H. Kennedy, Rockport, Ind., is interested.

*OZARK & CHEROKEE CENTRAL (ST. LOUIS & SAN FRANCISCO).—Contract reported let to Johnson Bros. for building the extension of this road from Okmulgee, Ind. T., to Shawnee, Okla. T., 75 miles.

P

PACIFIC & IDAHO NORTHERN.—Proposed extension from Council, Idaho, to Lardo, 40 miles. E. M. Heigho, Weiser, Idaho, is Vice-President and General Manager.

*PAMLICO, ORIENTAL & WESTERN.—The first part of this line from Newbern, N. C., to Bayboro, 17½ miles, is practically completed. The road will be extended through Stonewall, Oriental and Vandemeer, to a point near the mouth of Goose Creek, Pamlico Sound, N. C., 37½ miles. The W. A. Cullen Construction Co., 25 Broad Street, New York, is the contractor. M. DeW. Stevenson, of Newbern, N. C., is interested.

PARAGOULD & MEMPHIS.—This road, operating a line from Cardwell, Mo., to Manila, Ark., 24 miles, proposes to build the following extensions: From Cardwell north to Poplar Bluff, Mo., about 50 miles; from Cardwell west to Paragould, 12 miles; from Manila southwest to Marked Tree, 30 miles, and from Manila southeast to Osceola, 16 miles. W. E. Winnis is Chief Engineer; F. Quinn, General Manager, and J. E. Thomas, Second Vice-President, all of Cardwell, Mo. (See cut.)

*PARKERSBURG BRIDGE & TERMINAL (WABASH).—New line from Johnson, W. Va., west to Little Hocking, Ohio, 11 miles. Surveys completed and rights of way secured. Grading was started some time ago, but work was suspended. Permission has been granted this company by the Secretary of War to build a bridge across the Ohio River. S. D. Brady, Parkersburg, W. Va., is Chief Engineer.

PARKERSBURG, POMEROY & WESTERN.—Incorporated in Ohio to build from a point on the Ohio River opposite Parkersburg, W. Va., to Toledo, Ohio. C. F. Evans, J. K. Brandon, C. E. Bryan and F. L. Cooperider are named as incorporators.

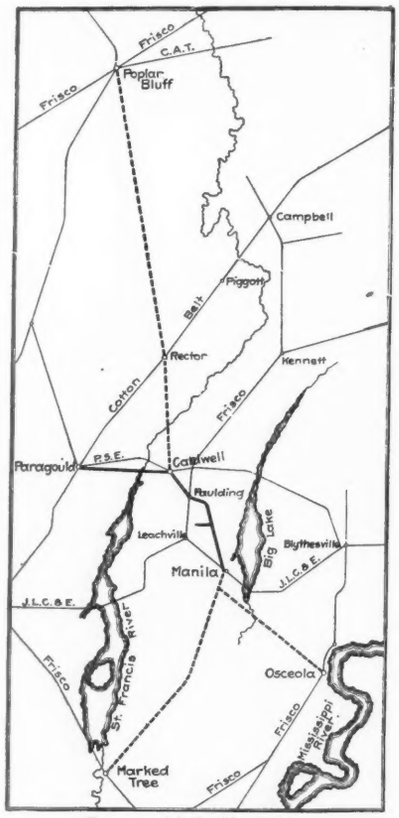
PAWNEE RAILROAD.—The Peabody Coal Co., which controls this road, has filed notice with the Secretary of State of Illinois of an increase in its capital stock from $120,000 to $2,500,000. The road, which now runs from Auburn, Ill., east to Pawnee, nine miles, will, it is reported, be extended from Pawnee east to Taylorville, 17 miles.

PEACH RIVER & GULF.—This company, which operates a line from Timber, Tex., to Midline, 15 miles, proposes to build an extension to Beaumont. R. W. Luttrell, Galveston, Tex., is Chief Engineer.

PEARSONS & BALTIMORE.—Proposed new line from Pearsons, in St. Mary's County, Md., north to Baltimore, about 90 miles. C. L. Applegarth, S. A. Foutz, H. P. Pearsons and W. H. McGee, of Baltimore, are incorporators.

PENDLETON SOUTHERN.—Chartered in Oregon to build from Pendleton, in Umatilla County, southwest to Heppner, in Morrow County, 45 miles. C. J. Smith, C. H. Carter, T. C. Taylor and J. R. Raley, of Pendleton, Ore., are named as incorporators.

*PENNSYLVANIA.—Franchise granted to build a double-track railroad from the boundary between New York and New Jersey, under the Hudson River, opposite the west end of Thirty-first street, Manhattan, running thence under the Hudson River and Thirty-first street to the East River, and under the East River to the Borough of Queens. Also for a line of two tracks from the terminal station at Thirty-third street and the East River to a terminal in Queens, with right for an additional track on Thirty-third street between Fifth and Seventh avenues. The rental to be paid has been agreed upon by the city and the company, and $75,535 will be paid annually for the first 10 years, and after that $114,871 will be paid annually for the next 15 years. The franchise may be readjusted at the end of 25 years. The corporate name of the new tunnel under the Hudson River, incorporated at Trenton, New Jersey, is the Pennsylvania, New Jersey & New York, and



Paragould & Memphis.

the corporate name of the tunnel to connect the Pennsylvania and Long Island roads is the Pennsylvania, New York & Long Island. Contract for building the two tunnels under the Hudson River let to the O'Rourke Engineering Construction Co. The contract for the tunnels under the East River (New York to Long Island City) has been awarded to S. Pearson & Son., Ltd., an English firm, which built part of the New York & Jersey tunnel in 1889. Work on both contracts in progress. Contracts for electrification and equipment let to Westinghouse, Church, Kerr & Co.

——*Tunnel under Bergen Hill, Weehawken. Contract reported let to the John Shields Construction Co., of New York.

——Tunnel for the site of the new terminal passenger station, between Seventh and Ninth Avenues, New York City, to the East River. Contract to be let this year.

——New terminal passenger station in New York City. Contract to be let this year.

——*Double-track elevated freight line, 3,700 ft. long, along Duquesne Way, Pittsburg, over Ninth, Seventh, Sixth, Fifth, Fourth and Third Streets to a point near the junction of Water Street, Duquesne Way and Pennsylvania avenue. Contract let to McClintic-Marshall Construction Co., of Pottstown, Pa.

——*Work has been resumed on the improvements to the Philadelphia, Baltimore & Washington in Wilmington, Del. The contractors are Ryan & Kelly.

——*Elimination of grade crossings in Camden, N. J., by elevation of tracks along Bridge Avenue. The work includes the building of eight bridges. Contract let to Sparks & Evans, of Philadelphia.

——*Work in progress on the second-track improvements between Parkesburg and Columbia, Pa. John Shields, New York; Chas. A. Sims & Co., Philadelphia; Ryan & Kelly, Philadelphia; P. McManus and Kerbaugh Construction Co., are the contractors.

——*Contract let to Reilly & Webber, of Philadelphia, for building a large classification yard at Hollidaysburg, Pa. The contract provides for the grading and masonry work, comprising about 1,400,000 yds. of borrowed embankment, about 150,000 cu. yds. of excavation, and a change of the channel of a creek and of two undergrade bridges.

——*Contract for the double track tunnel under Virginia Avenue, Washington, D. C., has been let to the Drake & Stratton Company, of Philadelphia. One-half completed.

——A "jump-over" is to be built at South Fork, Pa., 12 miles east of Johnstown, to enable eastbound passenger trains to pass the junction with the Windber branch without crossing at grade the path of freight trains moving from the westbound main line to the branch. Estimated cost, $130,000. Contracts will probably be let soon.

——*Contract let to Kerbaugh Construction Co., of Philadelphia, for building a cut-off 1½ miles long at Highspire, near Harrisburg.

——Extension of the four-track system on the Monongahela Division. Announced that this work will be done this year. There are now 15.05 miles of four-track on this division.

——Further completion of the four-track system on the Middle Division. To be done this year.

——New second track and sidings in the coke region. Authorized.

——The passenger yard near the Union Station at Pittsburg will be enlarged at a cost of $500,000.

——Proposed enlargement of the yards at Olean, N. Y., by adding about 15 miles of track.

——Reported conversion of stock yard at East Liberty, Pa., into a freight yard, with a capacity of 2,000 cars.

——Reported that the double tracking of the Belvidere Division, which runs from Trenton, N. J., to Manunka Chunk, 68 miles, will be completed. At present 1.92 miles are double-tracked.

——Branch from Kennerdell, Venango County, Pa., to Grove City, 18 miles. Proposed.

——*Tide-water terminal at Greenville, N. J. About 75 per cent. filled in.

——*Terminal station at Washington, D. C. Contract let to Thompson, Starrett & Co. Work in progress.

——*Low-grade improvements between Glen Loch, Pa., and Thorndale, 7 miles. Work in progress.

——Officially announced that two additional tracks will be built on the New York Division between Trenton, N. J., and Newark, making it a six-track system. Nothing done.

——Change of line between Mayes and Granville, on the Middle Division. Projected.

——Improvements to freight yards at East Liberty and Brushton, Pa. $300,000 appropriated. Nothing done.

——Elimination of curves on the Pittsburg Division between Latrobe and Millwood, seven miles. The improvement will cost in the neighborhood of $4,000,000 and will require the removal of about 4,500,000 cu. yds. of earth. Grades will be reduced from 53 ft. to 15 ft. per mile, and a large number of very bad curves eliminated. Nothing done.

——Plans completed for a change of line on the Philadelphia, Baltimore & Washington between Principio, Md., and Oakington, 6½ miles. The work will include a viaduct on the Havre de Grace side of the Susquehanna River about 900 ft. long. Nothing done.

——Four-track line from Radebaugh, Westmoreland County, Pa., east to Beatty, 11 miles, to cost between $4,000,000 and $5,000,000. It will take three years to complete the work. Nothing done.

——See Cherry Tree & Dixonville.

——See Franklin & Parker's Landing.

——See New York Connecting.

The BARRETT Quick-Acting TRACK JACKS

Represent the Experience of over TWENTY YEARS in attaining their EXCELLENCE IN DESIGN AND CONSTRUCTION

They have stood the test of time and as a result have been adopted as a Standard by the

RAILWAYS OF THE WORLD

AWARDED THE GOLD MEDAL

Highest Award at the Louisiana Purchase Exposition, St. Louis, 1904

No. 1—TRACK JACK 10 Tons

No. 17—SINGLE ACTING TRACK JACK. 10 Tons

No. 21—SIDE FOOT LIFT TRACK JACK

For work in tunnels, or where track is close to wall, fence, platform, etc.

No. 6—BALLAST GANG TRACK JACK. 15 Tons

No. 10—COMBINED TRIP AND AUTOMATIC LOWERING JACK

Barrett Track Jacks are Easily Operated, Convenient to Handle, Positive and Durable

We offer the most complete line of Track Jacks manufactured anywhere in the world. Capacities 5 to 35 tons. Built on a **FOUNDATION OF QUALITY**
BEWARE OF CHEAP IMITATIONS constructed by unskilled hands with only a few months' experience, and which represent only increased operating expenses and inconvenience

Barrett Jacks are Manufactured ONLY by

THE DUFF MANUFACTURING COMPANY, PITTSBURG, PA.

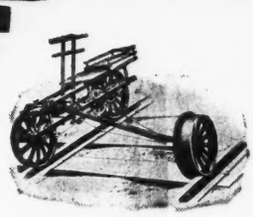
WORKS:—ALLEGHENY, PA. **FAIRBANKS, MORSE & CO., CHICAGO, Agents for Railroad Department**

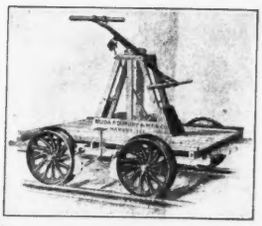
Gold Medal Track Goods

Gold Medal Track Goods

86.5 per cent. of the Railroad Mileage in the United States are users of

BUDA TRACK SUPPLIES





We manufacture the most complete line of track appliances in this country. Our facilities enable us to handle our orders promptly and with a saving of cost to our buyers. We turn out only the highest grade work and our devices may be relied on in every way.

Buda Hand and Push Cars, Velocipedes, Paulus and Buda Track Drills, Buda Side Track Derail, Wilson Drills, Rail Benders, Jim Crow and Roller Patterns, Track Levels and Gauges, Car Replacers and Wrecking Frogs, Friction and Ratchet Jacks, Crosing Gates, Safety Switch Stands.

PAIGE IRON WORKS DEPARTMENT is fully equipped to handle intricate layouts of any description. Split Switches, Rigid and Spring Frogs, Crossings, Curves, Hard Centers.

WARNING
PERSONS ARE FORBIDDEN TO RIDE OR WALK ON THIS TRACK OR THIS COMPANY'S WAYLAND. ANY ONE DOING SO WILL BE PROSECUTED FOR WILLFUL TRESPASS

Descriptive circulars of any specialty furnished on request

BUDA FOUNDRY & MANUFACTURING CO.

PAIGE IRON WORKS

General Offices: Railway Exchange Bldg., Chicago **New York Office, Havemeyer Bldg. Works, Harvey, Ill.**

PENNSYLVANIA LINES WEST.—Reported plan to lay a second track on the Pittsburg, Cincinnati, Chicago & St. Louis from Indianapolis east to Richmond, Ind., 68 miles, and from Xenia, Ohio, northeast to Florence, 24 miles. Contracts may be let soon.

——Second track on the Cincinnati Division of the Pittsburg, Cincinnati, Chicago & St. Louis between Foster, Ohio, and Morrow, 10 miles. Preliminary surveys. Nothing further being done.

——Elevation of tracks in Cincinnati eliminating 28 crossings and costing about $1,500,000. Plans not settled.

PENNSYLVANIA ROADS.—Charter granted to the Kimberly Run Coal Co., to build from its coal mines, a few miles east of Somerset, to a connection with the Baltimore & Ohio at Somerset. D. B. Zimmerman, Somerset, Pa., may be addressed. (Mar. 11, 1904.)

——Rights of way being secured for a new line from Bolivar, Pa., south to Ligonier, in Westmoreland County, 14 miles. The Oliver & Snyder Co. is interested. (Mar. 11, 1904.)

——Projected electric road from Newcastle, Pa., north via Pymatoon to Meadville, 50 miles.

PENNSYLVANIA WESTERN.—Charter granted in Pennsylvania to build from Redbank Junction, in Armstrong County, to Enon, in Lawrence County, 60 miles. Nothing done. Edward B. Taylor, Sewickley, Pa., is President.

PENSACOLA, ALABAMA & WESTERN.—Chartered to build from Pensacola, Fla., to the Alabama state line, 45 miles. H. L. Covington is President, and W. J. Forbes, Secretary, both of Pensacola. (Mar. 11, 1904.)

PENSACOLA-ANDALUSIA.—Projected road from Pensacola, Fla., to Andalusia, Ala., 80 miles. A. B. Steele, Pensacola, is said to be interested.

PENSACOLA & MEMPHIS AIR LINE.—Incorporated in Mississippi to build a railroad from Memphis, Tenn., via Watervalley and Meridian, Miss., to Pensacola, Fla., 400 miles. H. J. Forsyth, of Memphis, and J. W. Buchanan, Attorney for the St. Louis & San Francisco, are incorporators.

PENSACOLA, MERIDIAN & NORTHWESTERN.—Projected line from Pensacola, Fla., through Meridian, Miss., to Winona or Grenada, Miss., with a probable extension to Memphis, Tenn. W. V. Belhaut, St. Louis; M. F. Smith, Vicksburg, and John A. Lewis, Meridian, Miss., are interested. (Mar. 11, 1904.)

PERE MARQUETTE.—Reported that this company will make important betterments and improvements this year, among which are the following: On the Buffalo Division, larger yards at St. Thomas, Sarnia, Blemheim and Walkerville, Ont.

——40 new passing tracks and a new slip and dock on the Canadian side of the Detroit River above Walkerville.

——On the Chicago Division, a large freight house at Chicago.

——Cut-off from Riverside, Mich., along Paw Paw Lake north to Covert, 20 miles. Proposed.

——Extension of the Flint River branch from Fostoria north to Mayville, six miles. Proposed. This would make a line from Flint to Port Huron 35 miles shorter than the company's present line, by way of Saginaw.

——Connecting branch from Stratford, Mich., south to Leota, 30 miles. Surveys completed. (Mar. 11, 1904.)

——See Lake Erie & Detroit River, under Canada.

*PERLA NORTHERN.—Work in progress from Perla, Ark., in a northerly direction through Butterfield and thence northeast through Lonsdale to Whittington, in Garland County, 23 miles. Eight miles completed last year. The line will eventually be extended to Waldron, Ark. A. Strauss, Chemical Building, St. Louis, Mo., is President.

PETERSBURG & CLAREMONT TERMINAL R. R. & IMPROVEMENT.—New line in Virginia from a point near Petersburg to run east about 20 miles to the James River near Claremont. May be extended to the western border of the State. Organization completed. Preliminary surveys and estimates made. No contracts yet, but negotiations pending. Geo. J. Seay, Petersburg, Va., President. (Mar. 11, 1904.)

*PHILADELPHIA & READING.—Contracts let for the grading and masonry on section 2 of the New York Short Line to the B. M. & J. F. Shanley Co., Philadelphia, and for the grading and masonry for additional tracks on the Philadelphia, Newtown & New York branch to Ryan & Kelly, also of Philadelphia. The new cut-off is between Newtown Junction, Pa., and Neshaminy Falls, 10 miles. The entire line is now under contract, as the work on sections 1 and 3 has been let to the Millard & McGraw Construction Co. and the E. E. Smith Construction Co., both of Philadelphia. Section 2 extends from a point about 500 ft. east of the crossing of the Krewstown road to about 450 ft. west of the Southampton road, a distance of about two miles. The contract let on the Newtown Division takes in that part of the road between Logan and Crescentville, 2.1 miles.

——Reported plan to build a large freight yard on the line of the New York Short Line.

——*Contract let to Ryan & Kelly, of Philadelphia, for straightening the main line from a point about seven-eighths of a mile above Swedeland, Pa., to a point about one mile below that village.

——*Contract for a third track between Phœnixville, Pa., and Perkiomen Junction, 2½ miles, let to Smith & Campion.

PHILADELPHIA TERMINAL.—Application made for charter to build 28 miles of railroad in Chester and Delaware Counties, Pennsylvania. One line will run from the western terminus of the Market Street Elevated Railroad Company, Philadelphia, to Williston, Chester County, and the other from the same terminus to Eddystone, Delaware County. Clarence Wolf, of Philadelphia, is President.

PHILIPPINE RAILROAD.—Incorporated in New Jersey to operate and maintain a railroad in the Philippine Islands. F. W. Mattocks, of Demarest, N. J., is an incorporator.

*PHILIPPINE RAILROADS.—Franchise granted the Manila Ry. Co. to build from Guiguinto north to Calantuan, 40 miles. The only road in operation at the present time in the Philippines is the line from Manila north to Dagupan. (Mar. 11, 1904.)

PHILLIPS, KENNAN & CHIPPEWA FALLS.—Incorporated in Wisconsin, to build from Phillips through Price, Taylor and Chippewa Counties to Chippewa Falls, 75 miles. The company has acquired the franchises and property of the Phillips & La Crosse, running between Phillips and Kennan. J. S. Maxwell, M. A. Hoyt and E. A. Brown, all of Milwaukee, Wis., are incorporators. (Mar. 11, 1904.)

PICKENS & ADDISON.—Charter granted to build from Pickens, in Randolph County, W. Va., southwest to Addison, 15 miles. F. O. Havener, Parkersburg, W. Va., and J. F. Johnson, Pickens, are incorporators. (Mar. 11, 1904.)

PIEDMONT ELECTRIC.—Charter granted this company in Georgia. It is proposed to build an electric railroad from Atlanta, Ga., through Roswell and Alpharetta to Cumming, 23 miles. J. A. Tyler and C. R. Maddox, of Atlanta, are incorporators.

PINEY RIVER & LOUP CREEK.—Incorporated in West Virginia to build from Big White Stick, in Raleigh County, to Price Hill, in Fayette County, about 12 miles. C. T. Jones, C. R. Summerfield and S. L. Walker, of Fayetteville, are incorporators.

*PITTSBURG & ALLEGHENY VALLEY (Electric).—Contract let to Southurst, Allen & Baker, of Philadelphia, for building this proposed electric road from Oakmont, in Allegheny County, Pa., southeast to Blairsville, in Westmoreland County, 30 miles. The work will cost about $1,000,000.

PITTSBURG & ALLEGHENY SUBWAY TUNNEL.—Franchise asked to build a tunnel from Grand Street, Pittsburg, to a point on North Avenue, Allegheny, near Sandusky Street, passing 20 ft. below the bed of the Allegheny River. The tunnel will be designed for two tracks for street cars, and a roadway for carriages and wagons. R. L. Henderson is President, and J. H. Armstrong, Vice-President, Pittsburg, Pa. (Mar. 11, 1904.)

PITTSBURG & WESTMORELAND.—Charter granted this company in Pennsylvania to build a road from North Huntingdon, in Westmoreland County, to Herminie, 5 miles. E. B. Irwin, Harrisburg, Pa., is President.

PITTSBURG, BESSEMER & LAKE ERIE.—Preliminary surveys have been completed and rights of way secured for a line from Butler, Pa., to Newcastle, 30 miles.

PITTSBURG CONNECTING TERMINAL.—Chartered in Pennsylvania to build a terminal and a connecting railroad in Pittsburg. W. C. Farnsworth, Harrisburg, Pa., is President. (Mar. 11, 1904.)

PITTSBURG, LISBON & WESTERN.—Proposed extensions from Lisbon to Minerva, Ohio, 20 miles, and north to Salem, 8 miles. N. B. Billingsley, Lisbon, Ohio, is President. (Mar. 11, 1904.)

PITTSBURG, SUMMERVILLE & CLARION.—Location surveys being made for an extension from Mill Creek, Pa., to Hallton, 36 miles. C. F. Heidrick, Clarion, Pa., is President.

PLACERVILLE & LAKE TAHOE.—Incorporated in California to build from Placerville, in El Dorado County, to Pino Grande and thence to Tallac, 65 miles. Eight miles to Camino completed last year. J. H. Swift, J. D. Brown, S. J. Bassett and W. J. Barnett, of Placerville, Cal., are incorporators.

PLANT CITY, ARCADIA & GULF.—Incorporated in Florida to buy 12 miles of railroad already built out of Plant City, belonging to the Warnell Lumber & Veneer Co., and to extend it 75 miles to the Gulf. C. A. Root, D. C. Thompson and William Schneider, of Plant City, Fla., are incorporators.

POCAHONTAS & WESTERN.—Charter granted this company in Virginia, with principal office at Roanoke, to build a railroad in Tazewell County. L. E. Johnson, J. C. Callahan and L. B. Ware are incorporators.

PONCE & GUAYAMA.—Incorporated to build a steam road from Ponce, in the Island of Porto Rico, east to Guayama, 50 miles. L. A. Ford, Henry Endicott, Jr., and J. C. Rice, all of 70 State Street, Boston, Mass., are Incorporators. (Mar. 11, 1904.)

PORT ANGELES & EASTERN.—The British-American Finance Co. is reported as having been organized to build this road from Port Angeles, Wash., to Olympia, 135 miles. Surveys for the entire line have been completed and 10 miles have been graded out of Port Angeles. G. A. Cushing, Port Angeles, is President.

PORTLAND CONSOLIDATED RAILROAD (Electric).—Articles of incorporation filed by this company in Oregon, with an authorized capital of $5,000,000, to build an electric railroad from Portland to Vancouver and take over the lines heretofore owned and operated by the Portland Street and the City & Suburban railway companies. J. C. Ainsworth, C. A. Dolph and A. L. Mills, of Portland, Ore., are named as incorporators.

PORTLAND, MONTPELIER & HUNTINGTON.—Incorporated in Indiana with a capital of $1,400,000. The proposed route of the railroad is not stated. The headquarters of the company will be at Montpelier. W. F. Sinclair, D. R. Hardman and D. A. Williamson are incorporators.

PORTLAND, NEHALEM & TILLAMOOK.—Projected line in Oregon from Portland west through Washington County and south through Tillamook County. Bill introduced in the legislature requiring railroads to interchange cars and establish rates for joint traffic into terminals, in order to secure an entrance to Portland for this company over some existing line.

PORTLAND, SALEM & WEST SIDE (Electric).—Articles of incorporation filed by this company in Oregon to build an electric road 45 miles long. The names of incorporators are not stated.

PORTLAND, SANDY & MOUNT HOOD (Electric).—Incorporated in Oregon to build an electric road from Portland east to Fairview and Troutdale, 15 miles, and thence eastward to the base of Mount Hood, 40 miles. Seneca Smith, Napoleon Davis and Guy G. Willis, of Portland, are incorporators.

PORTLAND SOUTHERN (Electric).—Reported that this company will build from Portland, Ore., south to Salem, 52 miles.

*PORTO RICO ROADS (Electric).—The Porto Rico Light & Power Co. has begun work on an electric railroad between San Juan, Porto Rico, and Ponce, 70 miles. The line will pass through Rio Piedras, Caguas and Trujillo Alto.

*POTOMAC & POCAHONTAS.—New road from Keyser to Maysville, W. Va., 30 miles. Grading in progress. J. B. Caldwell, Brookville, Pa., is Chief Engineer. (Mar. 11, 1904.)

POWELL'S MOUNTAIN MINERAL.—Proposed line in Tennessee and Virginia from Lone Mountain, Tenn., via Griggs, Nerxes and Nile, to Sneedville, 26 miles, and thence via Clinchport to St. Paul, a total of 95 miles. Surveyed. Forty miles of old grade to be used. Building depends on litigation now going on between the South and Western Railroad and the Clinchfield Corporation. L. M. Jarvis, Sneedville, Tenn., is President.

PRESCOTT & NORTHWESTERN.—This road, which now runs from Prescott, Ark., northwest to Tokie, 33 miles, will, it is reported, be extended eight miles from Tokie. W. N. Bemis, Prescott, is President.

PRESCOTT & UNION.—Incorporated in Arizona, to build from Whipple Barracks, via Prescott, to Palace, 25 miles. F. L. Wright and T. C. Job, Prescott, Ariz., are incorporators. (Mar. 11, 1904.)

R

RAILWAY VALLEY.—Incorporated in New Jersey to build from New Orange to Summit, six miles. Louis Keller, Springfield, N. J., and H. F. Dankel, Roselle, N. J., are incorporators.

*RALEIGH & PAMLICO SOUND.—This company, whose projected line will run from Raleigh, N. C., via Wilson, Snow Hill and Greenville to Washington, N. C., 114 miles, has construction work under way by its own forces from Raleigh to Middlesex, 28 miles. Grading is completed for 12 miles and track laying for 6½ miles. J. M. Turner, Raleigh, N. C., is President.

*RALEIGH & WESTERN.—Extension from Colon, N. C., to Salem, 90 miles. About 15 miles west from Cumnock, N. C., to Harpers has been graded and location surveys finished as far as Winston. The road runs at present between Colon and Randleman, 56 miles, with a branch line from Colon to Cumnock, eight miles. S. A. Henszey, 52 Broadway, New York, is President.

RALEIGH & SOUTHWESTERN.—Incorporated in West Virginia to build from Beaver Creek, Nicholas County, to the mouth of Soak Creek, Raleigh County, 40 miles. C. H. Krise, of Raleigh, W. Va., is interested. (Mar. 11, 1904.)

READING, LANCASTER & SOUTHERN.—New line between Baltimore and Reading. Rights of way have been obtained for two-thirds of the distance. Isaac Spatz, of Mohnsville, is President. (Mar. 11, 1904.)

RED LAKE & MANITOBA.—Incorporated in Minnesota to build from Lower Red Lake, Beltrami County, to White Fish Lake, thence south and east to connect with the Minnesota & International in Beltrami County. Charles M. Amsden, C. A. Smith and C. J. Johnson, of Minneapolis, are incorporators.

RED RIVER & SOUTHWESTERN.—Reported that work will be resumed on this road from Henrietta, Tex., to Abilene, 135 miles. About 30 miles from Henrietta to Archer City were graded a number of years ago. Rights of way practically secured. M. J. Healy is General Manager and F. C. Hand, Chief Engineer, both of Henrietta.

RED RIVER VALLEY (ARKANSAS).—Chartered in Arkansas to build from Frostville, in Lafayette County, southwest to the State line of Louisiana, 12 miles. E. W. Frost, E. A. Frost and H. R. Frost, of Frostville, are incorporators.

RED RIVER VALLEY (Electric) (WISCONSIN).—Order reported to have been placed with the Westinghouse Co., of Pittsburg, for machinery for this electric road from Clintonville, Wis., through Eland Junction, Matton and Phlox to Antigo, 80 miles. The road is projected to be extended later to the mining region at Republic, Mich.

RICHMOND & CHESAPEAKE BAY.—An officer writes that this company, which has just been incorporated in Virginia, and of which Frank J. Gould, of New York, is President, and C. P. E. Burgwyn, Richmond, Va., is Chief Engineer, will begin building shortly. Contracts will be let at once. The line is to be operated by electricity from Richmond to Ashland, 17 miles, and by steam from Ashland via Ayletts to Tappahannock, with a branch from Ayletts to Gloucester Point. The only contract which has so far been let is to the Pennsylvania Steel Co. for 80 lb. rails. The work is easy, requiring no bridges, trestles or tunnels. The maximum grades will be 2 per cent. and the maximum curves 3 deg.

*RICHMOND, FREDERICKSBURG & POTOMAC.—Contract let to Reiter, Curtis & Hill, of Philadelphia, for new freight yard at Alexandria, Va., to cost about $1,000,000.

RICHMOND, RAPPAHANNOCK & EASTERN.—Incorporated in Virginia to build from Richmond to Urbanna, 59 miles. Surveys are reported to

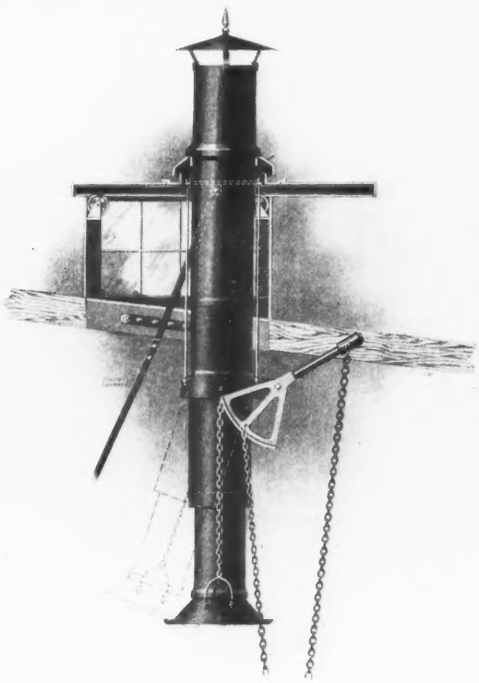
This border represents a full-sized cross section of "Vitribestos" and shows the air cells which extend entirely through the material. Write for sample which will be very interesting and gladly furnished upon request.

VITRIBESTOS

IS THE MODERN MATERIAL FOR

SMOKE JACKS

WATER-PROOF
NON-CORROSIVE
NON-SWEATING
NON-INFLAMMABLE



STRONG AND DURABLE AND ONLY WEIGHS 5 PER CENT. AS MUCH AS CAST IRON

Vitribestos, is Vitrified Asbestos, Chicago Fire-Proof Covering Co's Process and Patents

DICKINSON MOVABLE SMOKE JACKS CAN BE MADE OF VITRIBESTOS

PAUL DICKINSON

The Smoke Jack Man

143 Fifth Avenue CHICAGO, ILL.

have been made and the company is now making financial arrangements.

*RIO GRANDE, SIERRA MADRE & PACIFIC.—This road, which is the property of W. C. Greene and runs from El Paso, Tex., southwest to Terrazas, State of Chihuahua, Mexico, 250 miles, has begun an extension from Terrazas southwest to the new town of Dedrick at the junction of the Arros and Chico rivers, 150 miles. A concession has been granted by the Mexican Government for an extension 150 miles further to the port of Guaymas on the Gulf of California.

RIO GRANDE VALLEY (Electric).—Articles of incorporation filed at Santa Fe, N. Mex., to build an electric line 65 miles long.

ROARING FORK.—Chartered in Virginia to build from Norton, in Wise County, to the junction of Pot Camp on Roaring Fork of Powell River, connecting at Blackwood, Va., with the Louisville & Nashville. Calvin Pardee, who is interested in the East Tennessee & Western North Carolina, is President.

ROCHESTER, SCOTTSVILLE & CALEDONIA (Electric).—New company to be organized to build an electric railroad from Rochester, N. Y., southwest through Scottsville to Caledonia, 25 miles. J. F. Alden, H. C. Brewster and A. H. Brown, of Rochester, are said to be interested.

*ROCHESTER, SYRACUSE & EASTERN.—A contract has been let to J. G. White & Co., 49 Exchange Place, New York City, for building sections 4 and 5 of this road from Palmyra, N. Y., to Newark. Grading is now in progress on section 1 from Rochester to Fairport, by the contractors, F. T. Ley & Co., Springfield, Mass.; and on sections 2 and 3 from Fairport to Palmyra by the J. Shields Construction Co., of New York. Track laying will be begun early in the spring and it is expected that the road will be opened for traffic between Rochester and Lyons, 36 miles, by November, 1905. T. H. Mather, Syracuse, N. Y., is Chief Engineer.

ROCK CASTLE RAILROAD.—Incorporated in Kentucky to build a railroad from a point in Lawrence County to a point in Martin County, about 75 miles.

*ROCKDALE, JOLIET & LOCKPORT.—Rights of way reported secured for this road between Rockdale, Ill., and Lockport, and contracts for grading let. Frederick Bennett, Joliet, Ill., is President.

ROCKDALE, MOMENCE & SOUTHEASTERN.—Incorporated in Illinois to build from Rockdale, in Will County, south to Momence, in Kankakee County, and thence to a point on the state line between Illinois and Indiana. J. W. Murdock, F. A. Jackson and C. E. Robinson, of Joliet, Ill., are incorporators.

ROCKFORD BELT.—Articles of incorporation filed in Illinois to build a belt line in the city of Rockford, Ill., and nine diverging lines from the city of Rockford, one of which will go to Freeport. The capital stock of the company is $100,000, and the incorporators, B. Lee, S. F. Andrews, A. P. Humburt, F. L. DeLay and C. E. Feineich, all of Chicago.

ROCK LICK & WOLF CREEK VALLEY.—Incorporated in West Virginia to build from the mouth of Rock Lick Creek to Wolf Creek Valley, where connection will be made with the Deepwater Railroad. J. M. Richards, A. D. Smith and S. T. Carter, of Fayetteville, W. Va., are named as incorporators.

ROCK LEDGE & SOUTHERN.—Incorporated in Ohio to build from a point on the Hocking Valley, in Fairfield County, Ohio, south through Vinton, Jackson and Scioto counties to Portsmouth, 65 miles. G. M. Merritt, C. P. Cole, R. M. Dreisbach and H. H. Johnson are incorporators.

ROGUE RIVER VALLEY.—This road, which is in operation from Jacksonville, Ore., east to Medford on the Southern Pacific, six miles, will, it is reported, soon be extended from Medford northeast to Prospect, 40 miles.

RONCEVERTE, LEWISBURG & WESTERN (CHESAPEAKE & OHIO).—New line from Ronceverte northwest to Rupert, a point on the Meadow River, and eventually to Gauley, W. Va., 45 miles. Work to begin soon. (Mar. 11, 1904.)

RUSK & SOUTHWESTERN.—Incorporated in Texas to build a railroad from Rusk southwest a distance of 20 miles. W. H. Knox and S. P. Wilson, Rusk, Texas, are interested. (Mar. 11, 1904.)

RUSSELLVILLE & DOVER.—Incorporated in Arkansas, to build from Russellville, via Taral to Dover, 10 miles. W. A. Baird is President, and J. B. West and W. S. Hoggins, Dover, Ark., are incorporators. (Mar. 11, 1904.)

RUSSELL'S ISLAND & DEEP LAKE.—Incorporated in Florida to build a road from Deep Lake, Lee County, to the Gulf of Mexico, near Russell's Island, about 12 miles. The incorporators are: Henry C. Butcher, Jr., H. Radcliffe Roberts and Walter G. Langford.

S

SABINE & RED RIVER NORTHERN.—Organized in Texas to build from Lufkin south through Angelina, Polk, Hardin, Liberty and Chambers counties. Edward Kennedy, Beaumont, Texas, is said to be interested.

SACRAMENTO SOUTHERN.—Incorporated in California to build from Sacramento, south to Stockton, 45 miles, with branches to Walnut Grove, Antioch and Woodbridge. The project is reported to be a Southern Pacific enterprise. I. W. Hellman, Jr., and J. C. Kirkpatrick, Sacramento, are incorporators. (Mar. 11, 1904.)

ST. ANDREW'S, QUINCY & NORTHERN.—Chartered to build from Quincy, Fla., through Gadsden, Liberty, Calhoun and Washington Counties to St. Andrew's Bay, 75 miles. J. L. McFarlin, W. H. Davidson and A. L. Wilson, of Quincy, are interested. (Mar. 11, 1904.)

ST. CLAIR COAL RAILROAD.—Incorporated in Illinois to build from Collinsville, in Madison County, southwest to a point in St. Clair County. L. O. Whitney, Vienna, Ill., and W. S. Forman, East St. Louis, are incorporators.

ST. JOSEPH & EASTERN.—New line from Benton Harbor and St. Joseph to Cassopolis, Mich., 40 miles. Grading about two-thirds completed. Orville G. Wales, 4 La Salle street, Chicago, is interested.

ST. JOSEPH, ALBANY & DES MOINES.—Proposed line from St. Joseph, Mo., to Des Moines, Iowa, about 200 miles. Contracts for the first 40 miles of the line from Des Moines through Winterset to be let in May; all the right of way in Missouri has been secured, also some in Ringgold and Union Counties, Iowa. F. S. Mordaunt, Chicago, is President.

ST. JOSEPH, STANBERRY & NORTHERN.—Charter granted this company in Missouri to build from St. Joseph to Stanberry, 39 miles. George C. Sims, Des Moines, Iowa; J. E. Patrick and John J. Lea, of St. Joseph, are incorporators.

ST. LOUIS & KASKASKIA.—Incorporated in Illinois to build a line east from East St. Louis, crossing the Baltimore & Ohio Southwestern at Furmans, and thence northeast to a point on the boundary line of St. Clair County. E. W. West, Jr., and H. R. Heimberger, Belleville, Ill., and E. R. Rombauer, St. Louis, Mo., are incorporators. (Mar. 11, 1904.)

ST. LOUIS & NORTH ARKANSAS.—This road, which now runs from Seligman, Ark., to Leslie, 130 miles, will, it is reported, build an extension from Leslie to Settlement, 25 miles.

ST. LOUIS & SAN FRANCISCO.—This company is reported to have options on land at St. Bernard, La., to be used as a site for terminals. Plans, now ready, include a system of docks, to be one of the largest in the South, on which work is to be commenced in a short time.

——See Arkansas Valley & Western.
——See Houston, Beaumont & Northern.
——See Ozark & Cherokee Central.

*ST. LOUIS, BROWNSVILLE & MEXICO.—This road is now in operation from Brownsville, at the southern extremity of Texas, north to Robstown, 141 miles, and from Robstown east to Corpus Christi, 16 miles, and also a branch from Harlingen, 25 miles north of Brownsville, west to Fordyce, 80 miles. Extensions are projected from Robstown northwest to San Antonio, 125 miles, and northeast to Galveston, 180 miles. A contract has been let to Johnston Bros. for building the line from Robstown through Sinton to Bay City north and northeast 154 miles. Surveys have been completed, rights of way secured and grading is under way. Grading will probably not be begun on the extension from Bay City northeast to Galveston, 70 miles, until the line is completed to Bay City. Building of the line to San Antonio has not yet been begun. W.

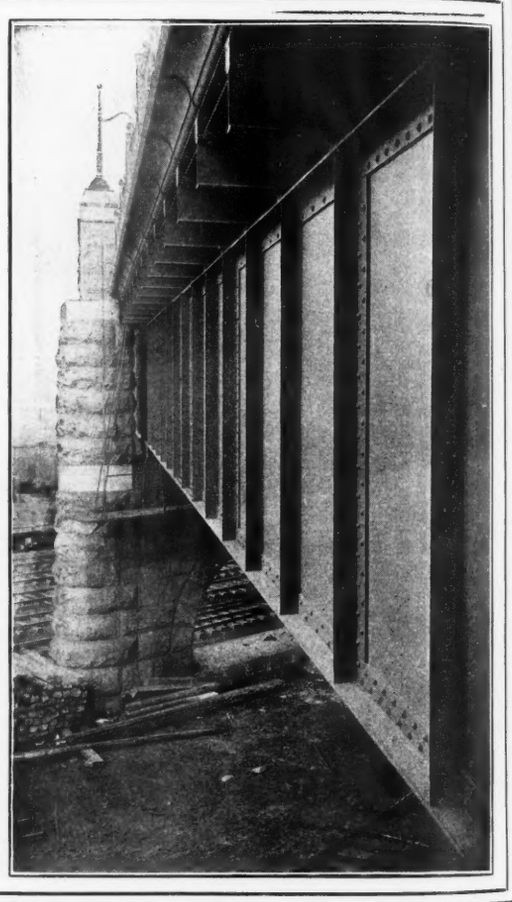
AN ILLUSTRATED FOLDER IN DUO-TONE SHOWING THE FOUR COLORS OF DIXON'S SILICA-GRAPHITE PAINT WITH PRACTICAL SUGGESTIONS FOR CONSTRUCTION AND MAINTENANCE PAINTING OF STEEL AND IRON.

ADDRESS

JOSEPH DIXON CRUCIBLE CO.
JERSEY CITY, NEW JERSEY, U. S. A.

MAKERS OF

DIXON'S SILICA-GRAPHITE PAINT



P. Homan, Corpus Christi, Tex., is Chief Engineer.

——Reported that this road will be extended from Brownsville, Tex., across the Rio Grande River southward to Tampico, Mex., 290 miles. This line, if built, would shorten the distance between Galveston and central Mexican points 285 miles.

ST. LOUIS, CABOOL & LITTLE ROCK.—Proposed line from Cabool, Mo., to Salem, 54 miles; Salem to St. Louis, 127 miles; Cabool to the Arkansas State line at Gainesville, Ozark County, 50 miles; from the State line to Little Rock, Ark., 130 miles, with a branch from Springfield, Mo., to Gainesville, 75 miles, a total of 436 miles. E. L. Sanks, Springfield, Mo., is Vice-President and General Manager.

ST. LOUIS, EL RENO & WESTERN (MISSOURI, KANSAS & TEXAS).—This road is now in operation from Guthrie, Okla., southwest to El Reno, 42 miles, and proposes to build extensions from Guthrie northeast to Peru Junction, Kan., on the Missouri Pacific, 120 miles, and from El Reno southwest to a connection with the Kansas City, Mexico & Orient near Hobart, 75 miles; also a branch line from Piedmont, midway between Guthrie and El Reno, southeast to Oklahoma City, 20 miles. C. C. Nelson, Fort Scott, Kan., is Vice-President.

ST. LOUIS, FREEBURG & FAYETTEVILLE.—Incorporated in Illinois to build from Belleville southeast to Fayetteville, 15 miles. E. A. E. Ambs, of O'Fallon, St. Clair County, Ill.; Adolph A. Wolf and Peter Yaeger, of Freeburg, Ill., are incorporators.

ST. LOUIS IRON MOUNTAIN & SOUTHERN.—Connecting branch from Theoes, Ill., southeast to Cairo, 25 miles. Proposed. (Mar. 11, 1904.)

*ST. LOUIS, LITTLE ROCK & GULF.—Contract let to Donald Grant & Co., of Faribault, Minn., for building the first section of this road from Little Rock, Ark., to Sheridan, about 40 miles. The road is proposed eventually to run from Little Rock to Port Arthur, Tex., 700 miles. H. S. Shaner, Little Rock, Ark., is President, and H. H. Fielder is Chief Engineer.

ST. LOUIS, MEMPHIS & SOUTHEASTERN.—Extension from Hoxie to Little Rock, Ark. Preliminary surveys made. B. F. Yoakum is President, and J. F. Hinckley, Chief Engineer.

ST. LOUIS NORTHEASTERN.—Incorporated in Illinois to build from East St. Louis northeast to Hillsboro, on the Cleveland, Cincinnati, Chicago & St. Louis, 50 miles. W. B. McKinley and B. R. Stevens, of Champaign, Ill., are incorporators.

ST. LOUIS SOUTHWESTERN.—This company, which owns the Texas & Louisiana, is reported to be making surveys from the terminus of the latter road at Monterey, Angelina County, Tex., via Windom, through San Augustine, Jasper, and Newton counties, to Newton, 50 miles.

——Extension from Gatesville, Texas, to Hamilton, 32 miles. Provided for by amendment to charter. Not to be built at present. (Mar. 11, 1904.)

——Extension from Hillsboro, Texas, to Whitney, 13 miles. Charter amended to permit. Nothing to be done at present. (Mar. 11, 1904.)

ST. LOUIS, WEBSTER & VALLEY PARK.—Chartered in Missouri to build from St. Louis to Valley Park, all in St. Louis County. S. S. Wallace and William Buckley are incorporators.

ST. MARYS & WESTERN.—Chartered in Pennsylvania to build from Johnsonburg to Benezette, 25 miles. J. K. P. Hall is President.

ST. PETERSBURG & GULF.—Incorporated in Florida to build from St. Petersburg to the Gulf coast, eight miles. F. A. Davis and W. L. Haddock, of Philadelphia, Pa., are interested.

SALEM, FALLS CITY & WESTERN.—Surveys have been completed and grading will be commenced at once by company's forces on an extension from Falls City, Ore., west 3½ miles. L. Gerlinger, Jr., Dallas, Ore., is General Manager.

SALINE VALLEY.—Incorporated to build from Lithium, Mo., on the Chester, Perryville & Ste. Genevieve, northwest to Saline River, thence up the river to a connection with the St. Louis, Iron Mountain & Southern through the counties of Perry, Ste. Genevieve, Saint Francois and Madison, about 40 miles. R. B. Andrews is interested.

SALISBURY RAILROAD.—Incorporated in North Carolina to build a line 100 miles long from Danbury, via Germantown and Salisbury, to connect with the Carolina Central at Monroe, N. C. (Mar. 11, 1904.)

*SALT LAKE & OGDEN.—Work in progress on an extension from Farmington, Utah, to Kaysville, 3½ miles, and location surveys are being made for an extension from Kaysville to Ogden, 16 miles. E. A. Vail, Salt Lake City, Utah, is Chief Engineer.

SAN ANTONIO & CARTHAGE.—Proposed line in New Mexico from San Antonio north to Carthage in Socorro County, five miles. The principal office of the company will be at Socorro. D. H. McMillan, Socorro, N. Mex., and E. L. Bartlett, Santa Fe, N. Mex., are interested.

SAN ANTONIO & EASTERN.—Incorporated in New Mexico to build from San Antonio to coal fields near Carthage, 12 miles. J. T. Fitch, S. P. Allen and W. W. Allen, of Kansas City, are incorporators.

SAN ANTONIO & GULF.—Surveys reported under way for an extension from Stockdale, Tex., east to Cuero, 40 miles. J. M. Lee, San Antonio, Tex., is President and General Manager.

SAN DIEGO EASTERN.—This company, incorporated in California with a capital of $10,000,000, proposes to build from San Diego, Cal., eastward to the Colorado River at Yuma, about 225 miles. The line has been surveyed and rights of way and franchises through the city of San Diego have been acquired. George W. Marston, San Diego, Cal., is President, John E. Boal is Vice-President and L. L. Boone, Secretary.

SANDY CREEK, KINGWOOD & CHEAT RIVER.—Incorporated to build from Cecil, Taylor County, W. Va., northeast to Kingwood, Preston County, 20 miles. Jas. H. Hair, C. S. James, L. R. Lewis and Geo. D. Prentice, Allegheny, Pa., are interested. (Mar. 11, 1904.)

*SAN FRANCISCO & NAPA.—This road, which is to run from San Francisco, Cal., via San Raphael to Napa, 50 miles, has been all graded, and 12 miles of track have been laid out of Napa.

SAN FRANCISCO & NORTHWESTERN (A., T. & S. F.).—This road is now operating a line for 40 miles south of Eureka and work is reported in progress on an extension from Alton, Humboldt County, Cal., south to a connection with the Atchison, Topeka & Santa Fe, near Point Richmond, 200 miles.

SAN FRANCISCO & SOUTHERN.—Incorporated in California to build from Santa Cruz through Pescadero and Half Moon Bay to San Francisco, 60 miles. L. F. Young, L. E. Prescott and G. H. Foulks, of San Francisco, are incorporators. (Mar. 11, 1904.)

SAN FRANCISCO, IDAHO & MONTANA.—Incorporated in Idaho to build from San Francisco to Butte, Mont., via Boise, Idaho, across California, Nevada, Oregon, Idaho and Montana, with branch lines in Nevada. The authorized capital is $50,000,000, of which $1,100,000 is reported subscribed. William Peyton Mason, of Minneapolis, is President.

SAN FRANCISCO RAILROAD (Electric).—Incorporated in California to build a street railroad from the foot of Market Street, San Francisco, to Ocean Beach, 10 miles. The authorized capital is $1,500,000. J. W. Scott, Oakland, Cal.; L. T. Wagner and J. H. Goldman, San Francisco, are incorporators.

SAN MARCOS VALLEY INTERURBAN (Electric).—This company plans to build a line from San Marcos, Tex., via Martindale, Fentress and Prairie Lee to Luling, 25 miles. George W. Megrew is engineer in charge.

SANTA CLARA INTERURBAN (Electric).—Incorporated in California, with an authorized capital of $5,000,000, to build an electric railroad from San Mateo southeast to San Jose, in Santa Clara County, 30 miles. E. M. Rea, San Jose; F. D. Dorman, Palo Alto, and J. C. Campbell, San Francisco, are interested. The new line will parallel the Southern Pacific.

SANTA FE CENTRAL.—See Colorado, New Mexico & Gulf.

——See Durango, Albuquerque & Gulf.

——See Torrance, Roswell & Gulf.

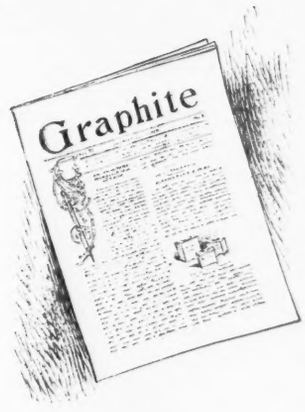
THE
PROTECTION OF STEEL

The presence of sulphurous gases, cinders and steam, combined with exposure to the elements, provide conditions most favorable to the rapid corrosion of steel work. Steel bridges and viaducts over railroad tracks are subjected to all of these in the greatest degree, none more so than the Willis Avenue Bridge over the New York, New Haven & Hartford R. R. freight yards and the Harlem River, New York City.

Adequate protection can be provided by paint.

In April, 1904, the accompanying view of one of the 15-ft. girders of the Willis Avenue Bridge was taken, and it plainly shows the absolutely perfect condition of Dixon's Silica-Graphite Paint after four years' exposure. Careful inspection further showed the unbroken condition of Dixon's Black on the rivet-heads, angles, flanges and webs of all girders, clear evidence that this coating resists the conditions which cause corrosion.

Time tests the efficiency of a paint. Dixon's Silica-Graphite Paint has been on the market 41 years. We can furnish records of its durability in all climates.



"GRAPHITE" FOR APRIL, 1905, CONTAINS MANY ILLUSTRATIONS OF NOTABLE BRIDGES AND BUILDINGS; WITH SHORT TALKS ON GOOD PAINT AND GOOD PAINTING. COPIES FREE UPON REQUEST.

ADDRESS

JOSEPH DIXON CRUCIBLE CO.
JERSEY CITY, NEW JERSEY, U. S. A.

MAKERS OF

DIXON'S SILICA-GRAPHITE PAINT

SANTA FE, PRESCOTT & PHOENIX (A., T. & S. F.).—Extension of the line east from Phoenix, Ariz., which is now in operation to Winkleman, 103 miles from Phoenix, to Dudleyville, three miles. Work stopped by court order.

——Extension from Dudleyville east to Benson, 85 miles. Proposed.

SANTA FE, RATON & EASTERN.—This company has filed incorporation papers in Colorado, with a capital of $300,000, to build from Raton, N. Mex., east to the Clark ranch, 10 miles.

SAVANNAH, SHILOH PARK & CORINTH.—Chartered in Tennessee to build from Allen's Creek, in Wayne County, Tenn., west through Savannah, Hardin County, to Corinth, in Alcorn County, Miss., 40 miles. J. J. Williams, D. A. Welch and A. W. Ross are interested.

SAVANNAH, STATESBORO & NORTHERN.—Charter applied for in Georgia to build a road 160 miles long from Statesboro to Louisville, from Louisville to Thomaston and from Thomaston to Washington. The principal office of the company will be at Savannah. B. T. Outland and J. S. Franklin, Portal, Ga., are incorporators.

SCRANTON, FACTORYVILLE & TUNKHANNOCK (Electric).—This company, whose line is projected to run from Scranton northwest through Clark's Summit, Waverly, Dalton and Factoryville to Tunkhannock, 25 miles, with branches to Lake Winola and Lake Carey, has filed a mortgage for $2,000,000 to the Imperial Trust Co., of Jersey City. James P. Dixon and Charles D. Sanderson, of Scranton, are reported interested.

SEABOARD AIR LINE.—Extension of Durham branch to Greensboro, N. C., and probably to Mt. Airy. Projected.

SEABOARD TRACTION (Electric).—Chartered in Virginia to build and operate an electric passenger and freight line 300 miles long from Richmond, Va., to Portsmouth. The principal office of the company will be at Suffolk, Va. L. R. Britt is President, and W. H. Robinson, Norfolk, Va., is Vice-President.

*SEBASTIAN COUNTY (Electric).—This company, which proposes to build an electric road from Fort Smith, Ark., via Bonanza, Jenny Lind, Greenwood, Salem, Huntington, Mansfield, Prairie Creek and Midland to Hartford, 49 miles, will probably let a contract for the first section of the road to Michael Wallis and the Fort Smith Contracting Co., both of Fort Smith, Ark. Grading is completed for three miles. S. A. Williams, Port Smith, Ark., is President.

SELMA & CAHABA.—New line from Selma, Ala., north to Birmingham, 60 miles. Surveys completed. H. L. McKee, Meridian, Miss., is President. (Mar. 11, 1904.)

SHAWNEETOWN & ROSICLARE.—Organized in Illinois to build a road from Rosiclare, in Hardin County, to Shawneetown, 32 miles. Reported in market for equipment. W. H. Swift, St. Louis, Mo., is President; S. G. McWade, Shawneetown, Ill., Vice-President.

SHEFFIELD RAILROAD (Electric).—Articles of incorporation filed in Alabama to build an interurban line 10 miles long connecting Sheffield, Florence and Tuscumbia. George Parsons, Henry Parsons and J. W. Worthington, all of Tuscumbia, Ala., are incorporators.

SHENANDOAH & SUBURBAN.—Charter granted in Pennsylvania to build from Shenandoah to Ringtown, five miles, connecting with the Lehigh Valley at Shenandoah, and with the Philadelphia & Reading at Ringtown. D. J. Langton, Shenandoah, is President. (Mar. 11, 1904.)

SHINGLEHOUSE RAILROAD.—Chartered in Pennsylvania to build from Ceres, McKean County, Pa., southeast to Shinglehouse, Pottery County, four miles. W. R. Page, Olean, N. Y., is President. (Mar. 11, 1904.)

SHORT CREEK VALLEY.—Incorporated in Ohio to build from New Athens, in Harrison County, northeast to Dillonvale, in Jefferson County, 15 miles. W. P. Moore and E. B. Thomas are interested.

SHREVEPORT & MEMPHIS.—Projected line from Shreveport, La., via Minden to Homer, 20 miles. A. T. Nelson, Minden, La., is interested. (Mar. 11, 1904.)

*SIERRA OF CALIFORNIA.—Extension from Campbell, Cal., to Sugar Pine, 12 miles. Completed to Tuolumne, three miles.

SILVERTON NORTHERN.—The Animas Forks extension of this road from Eureka, Cal., to Animas Forks, four miles, is now completed. The company proposes an extension of the Cunningham Gulch branch from Howardsville to Green Mountain, 1½ miles. Surveyed and grading to be begun in May.

SMITHONIA & NORTHERN.—Charter granted to build a railroad 20 miles long in the counties of Oglethorpe and Madison, in Georgia. J. M. Smith, L. E. Green, J. H. Powell and C. W. Johnson, Smithonia, Ga., are interested. (Mar. 11, 1904.)

SNAKE RIVER RAILROAD.—Incorporated in Oregon to build from Nagle, two miles east of Huntington, Ore., along the Snake River to Ballards' Landing, 75 miles.

*SOMERSET RAILROAD.—Contract reported let to J. S. Kaulback & Co. for building an extension of nine miles from Austin Deadwater, Me., to the head of Moxie Pond, within 20 miles of the Canadian Pacific. The road will ultimately be extended to Birch Point on the shore of Moosehead Lake, opposite Kineo. W. M. Ayer, Oakland, Me., is Manager, and J. F. Hill, Bingham, Me., Chief Engineer.

SOUTH & WESTERN.—Proposed extension from Clinchport, Va., northeast to Toms Creek, 30 miles.

——*Extension from Spruce Pine, N. C., to Marion, 40 miles. Work in progress. (Mar. 11, 1904.)

SOUTH ATLANTIC & MEXICAN GULF.—A charter has been granted this company in Georgia, with an authorized capital of $3,000,000, to build from Savannah southwest to a point on the Gulf of Mexico, 325 miles. P. H. Comas and F. J. Sweat, Savannah, are among the incorporators.

SOUTH BEND & SOUTHERN MICHIGAN.—This company, whose proposed road from South Bend, Ind., via Niles, Mich., and Berrien Springs to St. Joseph, 34 miles, is completed as far as Niles, 11 miles, proposes two extensions, one from Niles to Buchanan, six miles, and the other from South Bend to Chain Lakes, seven miles. Both of these have been surveyed. A. J. Hammond, South Bend, is Chief Engineer.

SOUTH CAROLINA ROADS.—Bill introduced in the South Carolina Legislature to charter a railroad to be built from Charleston, through Charleston, Berkeley, Georgetown, Florence, Marion and Harry Counties, to the North Carolina line, thence to Monroe, N. C.

——The Saluda River & Lumber Co. is about to build a logging road along the old bed of the Carolina, Knoxville & Western. Surveys are in progress, and it is expected that track laying will be begun very soon. R. E. Johnston, Greenville, S. C., is President. (Mar. 11, 1904.)

——New line from Green Sea to Howard, S. C., six miles. Surveys completed. J. P. Derham, Green Sea, is President. (Mar. 11, 1904.)

*SOUTH DAKOTA CENTRAL.—Extension from Colton to Madison, 20 miles. Projected. P. F. Sherman, Sioux Falls, is President.

SOUTHERN.—Surveys under way for a line between Marion, N. C., and Johnson City, Tenn.

——*Contract for building a branch from Mobile Junction to a point west of Bessemer, 2¼ miles, reported let to Agee & Co., Birmingham, Ala.

——*Contract reported let to Bowdry & Wilcox for building a branch from the main line of the Southern near Oakman, Ala., southwest 2½ miles to the property of the Atlas Coal Co.

——*Improvements to roadbed and laying of new rails on the Memphis Division, between Stevenson, Ala., and Memphis.

——Proposed extension of the second track west of Atlanta, Ga., 11 miles, to Austell, and also west of Birmingham, Ala.

——Extension from Stevenson, Ala., northeast via South Pittsburg, to Chattanooga, Tenn., 42 miles. Several surveys made, but nothing definitely decided. The company now uses the tracks of the Nashville, Chattanooga & St. Louis.

——Jellico, Tenn., to Middlesboro, Ky., 10 miles. Surveys completed.

——Middleboro to Harlan, Ky., 45 miles. Under survey.

——Connecting line from Clinton, Tenn., south to Loudon, on the main line, to shorten the haul between the coal fields and Chattanooga. At-

CARS 50,000 AND 60,000 FLAT AND GONDOLA CARS

LOCOMOTIVES

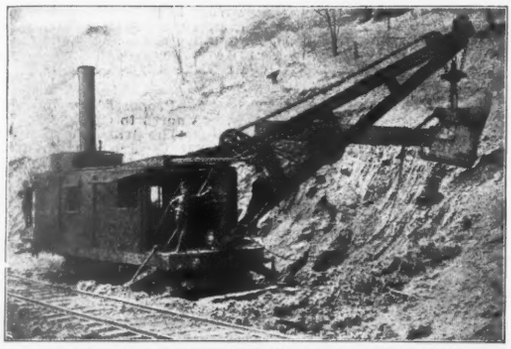
Any kind Standard and Narrow Gauge for Logging Roads and Contractors

Steam Shovels and Contractors' Equipment

70-ton Bucyrus built 1904
Marion AA Dump Cars

TO TRUNK LINES

Our shop facilities for overhauling locomotives insure your getting your equipment in a thorough state of repair. We can save you time and



money, and solicit your heavy repair work.

FITZ-HUGH, LUTHER CO.

CHICAGO, 1647 Monadnock
NEW YORK, 141 Broadway
ST. LOUIS, 1613 Chemical Bldg.
SAN FRANCISCO, Rialto Bldg.

Works, Hammond, Ind. (Chicago Suburb)

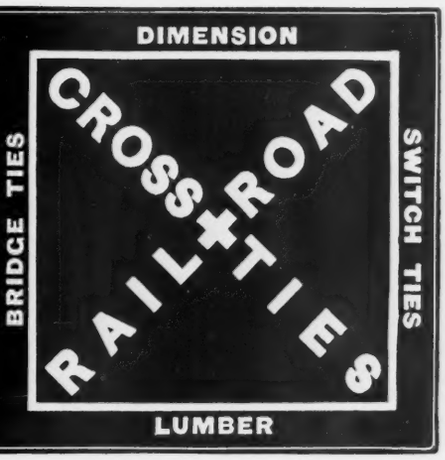
G.S. BAXTER & CO.

17 WILLIAM ST., NEW YORK

(TELEPHONE 5905 BROAD)

JACKSONVILLE, FLA.

MILL AND TIE CAMPS AT FARGO, CLINCH CO., GA.



JOHN B. WATSON

ENGINEER AND BROKER

RAILS AND RAILWAY EQUIPMENT

LIGHT AND POWER MACHINERY

DREXEL BUILDING PHILADELPHIA, PA.

AGENT EXCLUSIVELY.

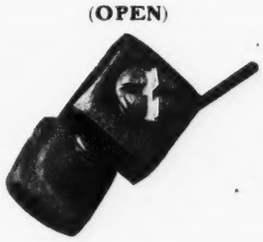
THE SAFETY NUT LOCK COMPANY

MINNEAPOLIS, MINNESOTA

There is but one Nut Lock on the Market.

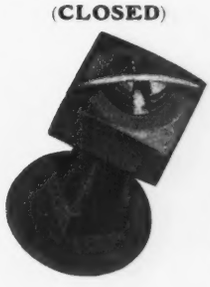
Send to us for a sample

(OPEN)



Factory: No. 3 George St.

(CLOSED)



If you happen to be interested in a cheap, simple, effective, durable lock, let us know

The Safety Nut Lock is a positive lock.
It is the kind that stays where placed.
It needs no attention. You know it's there.
For cheapness, simplicity, effectuality.
For durability and genuine worth it's It.

A reply to this ad. will bring to your desk all that you may wish to know concerning the best nut lock on the market.

Write at once and be convinced.

lanta and other points. Surveys completed, but no decision yet as to building.

——Extension from Jasper, Ind., to French Lick Springs, 20 miles. Located, but no prospects of immediate building.

——Extension from Gainesville, Ga., to mines near Dahlonega, 20 miles. Surveys.

——Extension from Burgin, Ky., southeast 119 miles, via Lancaster, to Jellico, Tenn. Several surveys made but nothing decided yet.

——A branch line from Maryville, Tenn., through the Blue Ridge Mountains to a connection with the main line of the Southern in North Carolina, 65 miles. Projected.

——Rabun Gap extension from a point 30 miles south of Knoxville to the Georgia line. Proposed.

——Double-tracking of the line from Greensboro, N. C., to High Point, and from Danville, Va., to Pelham, N. C. Surveys made.

——Rights of way reported obtained for Belzona extension in Mississippi, on which building will be begun this spring. This would be the first link in a line from Memphis, Tenn., to Jackson, Miss.

——See New Orleans Terminal.

SOUTHERN BELT.—Incorporated in Georgia to build a road about three miles long to the north and west of Atlanta, Ga., connecting the different lines of the Southern Railway which enter the City of Atlanta. J. S. B. Thompson, Atlanta, Ga., is an incorporator.

SOUTHERN ILLINOIS (Electric).—Surveys have been made and franchises and 75 per cent. of the rights of way obtained for this electric road, which is projected from St. Louis, via Belleville, Mascontah, Okawville, Hazleton and Irvington to Mount Vernon, Ill., 80 miles, with a branch from Irvington, via Centralia, Central City, Sandoval and Oden to Salem, 20 miles. John R. Piercy, of Mount Vernon, Ill., is President.

*SOUTHERN INDIANA.—This road, which runs from Terre Haute, Ind., southeast and east to Westport, 148 miles, is reported to have graded an extension from Terre Haute north to Humrick, Ill., 25 miles, on which six miles of track has been laid. Contract for a continuation of this extension from Humrick to Chicago Heights, 108 miles, reported let to the Kinser Construction Co., 1747 Railway Exchange Building, Chicago, to be completed by November 1.

SOUTHERN PACIFIC.—An officer writes that the company has authorized the building of a road from Hazen, on the main line of the Central Pacific, to a point near Churchill, on the Carson & Colorado. This connection will run into lands which will soon be brought into cultivation in the Carson basin in consequence of the completion of the irrigation works of the Reclamation Service of the United States Government and will make an outlet from the Tonopah mining district shorter than the present route via Reno over the Virginia & Truckee.

——Reported that the Carson & Colorado, Running from Moundhouse, Nev., to Keeler, Cal., 293 miles, will be converted into a standard-gage line; work to be begun at once.

——Cut-off from Wabuska, Nev., to Hazen, 27 miles, to avoid very heavy grades in the vicinity of Moundhouse, Nev. Projected.

——Surveys reported for extensions from Lockport, La., southeast to Cutoff, 12 miles, and from Arnaudville north to Port Barre, 12 miles. S. W. Stubbs, New Orleans, La., is the engineer in charge.

——Cut-off between Sunnyvale, near Palo Alto and Los Gatos, 10 miles. Projected.

——Battle Mountain cut-off from Piute, Nev., east to Shoshone. Nothing being done.

——Standard gaging of narrow gage line from Alma, Cal., south to Santa Cruz, 20 miles. Projected.

——*Cut-off from Third and Townsend Streets, San Francisco, south along the bay to San Bruno, 11 miles, including five tunnels. Under construction.

——Branch from Whitewater or Palm Spring, Cal., to run northeast about 40 miles across the San Bernardino Mountains to connect with the Atchison, Topeka & Santa Fe at Bagdad. Nothing being done.

——Extension into Mexico of the Imperial branch, which runs from Old Beach, Cal., to Calexico on the international boundary. Concession granted by the Mexican Government to J. A. Naugle, of Guaymas, State of Sonora, Mexico, to build 300 miles of railroad in Lower California. Obtained in the interest of the Southern Pacific. Reported that construction will be begun soon.

——See Gulf, Western Texas & Pacific.

——See New York, Texas & Mexican.

SOUTH McALESTER, RED RIVER & GULF.—Proposed route of this road is from South McAlester, Ind. T., through Blanco to Roswell, 80 miles. F. H. Kellogg, South McAlester, Ind. T., may be addressed.

SOUTHPORT & NORTHWESTERN.—Charter granted in North Carolina, under which, it is reported, the Waccamaw Land & Lumber Co. will build a line from Southport, via Whiteville, to Sanford. The authorized capital stock is $2,000,000. John D. Bellamy, of Wilmington, N. C., is interested.

SOUTHWESTERN (LOUISIANA & NORTHWEST).—Incorporated in Alabama to build a continuation of the Louisiana & Northwest from Natchitoches, La., south to a point on the Southern Pacific in Calcasieu or Acadia parish. G. E. Montgomery, Natchitoches, La., may be addressed.

SOUTH SHORE TRACTION.—Application made to the New York State Railroad Commission to build a trolley line 60 miles long through Suffolk and Nassau Counties, Long Island, beginning at Central Avenue, in Jamaica, passing through Hempstead, Oyster Bay and Patchogue, and terminating in Brookhaven. The company has an authorized capital of $2,000,000. J. A. Hawes is Vice-President.

SOUTHPORT, ATLANTA & WESTERN.—Incorporated in North Carolina, to build from Southport, N. C., north to Wilmington, 25 miles. C. B. Ware and A. J. Fahnstock are interested. The headquarters are at Southport. (Mar. 11, 1904.)

SOUTH JAMAICA, FREEPORT & MINEOLA.—Incorporated in New York, to build from the terminal of the Kings County Elevated in Brooklyn, to Freeport and Mineola, L. I. Work will be begun shortly. Charles Ensign, Hempstead, L. I., is President. (Mar. 11, 1904.)

SPARTANBURG & UNION.—Charter granted to build from Spartanburg, S. C., to Union, 30 miles. Connection will be made with the Charleston & Western Carolina at Spartanburg. (Mar. 11, 1904.)

SPOKANE & INLAND (Electric).—Reported that this electric road will be built from Spokane, Wash., into Palouse County. Contracts for grading the first 20 miles are to be let at once and the company expects to build between 30 and 40 miles this year. The road will later be extended 50 or 60 miles further. Jay P. Graves is President.

SPOKANE INTERNATIONAL.—Articles of incorporation filed by this company in the State of Washington to build from Spokane to the international boundary, where connection will be made with a branch to be built by the Canadian Pacific. D. G. Corbin, of Spokane; Chester W. Chapin and J. K. O. Sherwood, of New York, are incorporators.

*SPRINGFIELD & NORTHEASTERN (Electric).—This company will build a line between Springfield, Ill., and Lincoln, 30 miles. The L. E. Myers Co., Monadnock Building, Chicago, are the contractors. Grading completed for three-quarters of the distance and track laying to be begun early this spring.

SPRINGFIELD & PEORIA.—Incorporated in Illinois to build from Springfield north through Sangamon, Menard, Mason and Tazewell counties to Peoria, 50 miles. F. S. Peabody, A. W. Underwood and J. D. Adams, all of Chicago, are incorporators. (Mar. 11, 1904.)

SPRINGFIELD & SOUTHEASTERN.—Incorporated in Illinois to build from Springfield east to Shelbyville, 30 miles. E. D. Kerr, Brunswick, Ill.; B. P. Smith, Moweaqua, Ill., and T. F. Dover, Shelbyville, are incorporators. (Mar. 11, 1904.)

SPRINGFIELD & SOUTHWESTERN (MISSOURI PACIFIC).—Proposed line from Springfield, Mo., to a junction with the White River Railroad, which is now nearing completion. The line is now being surveyed, and contracts will be let and grading will begin in the spring. H. Rohwer, St. Louis, Mo., is Consulting Engineer.

SPRINGFIELD & WESTERN.—Chartered in Illinois to build from Springfield west through Morgan, Pike and Adams counties to Quincy, 100 miles. F. M. Mills, D. A. Watson, George A. Wood and R. H. McAnulty, of Springfield, and K. H. Seibel, of Chicago, are incorporators.

*SPRINGFIELD, CHARLESTON, WASHINGTON & CHILLICOTHE (Electric).—A contract has been let to the Champion Construction Co. for building this electric road from Springfield, Ohio, southeast through Charleston and Washington Courthouse to Chillicothe, 70 miles. Work in progress. H. L. Rockfield, Springfield, Ohio, is President, and E. B. Gunn, Chief Engineer.

SPRINGFIELD, LINCOLN, BLOOMINGTON, PEKIN & PEORIA (Electric).—Incorporated in Illinois to build an electric road from Springfield northeast through Lincoln to Bloomington, 50 miles, paralleling the Chicago & Alton between these points. D. W. Hart, Lincoln; Logan Hay, Springfield, and A. G. Kingman, Peoria, are incorporators.

SPRINGFIELD, PETERSBURG & BEARDSTOWN (Electric).—Articles of incorporation filed in Illinois to build an electric road from Springfield northwest through Petersburg to Beardstown, 45 miles. J. S. Hurle and J. S. Miles, of Petersburg, Ill., are interested.

*STANLEY, MERRILL & PHILIPS.—This road, which runs from Stanley, Wis., north to Hannibal, 24 miles, with a branch to Diamond Lake, has been extended from Hannibal to Jump River, nine miles, and will eventually be extended six miles further to Wilpin. Hill, Winston & Co., of St. Paul, Minn., are the contractors.

STATESBORO & NORTHERN.—Proposed line from Statesboro, Ga., through Summit and Swainsboro to Wrightsville. J. A. Bramet, Statesboro, Ga.; A. Herrington, Swainsboro, and B. L. Rountree, Summit, incorporators.

STEUBENVILLE & CANTON.—Incorporated in Ohio to build from Steubenville through Jefferson, Carroll and Stark counties northwest to Canton, 45 miles. T. H. Lucas, H. H. Smith and S. B. Pyle, of Steubenville, Ohio, are incorporators

STEWARTSTOWN RAILROAD.—Extension. See New Park & Fawn Grove.

SUGAR PINE.—Incorporated in California to build from a point near Campbell's Station, in Calaveras County, south to Strawberry Flat, in Tuolumne County, 40 miles. (Mar. 11, 1904.)

SUMTER & NORTHERN.—Chartered in South Carolina to build from Sumter north through Lee, Darlington and Chesterfield Counties to McBee, 40 miles, where connection will be made with the Seaboard Air Line. R. E. Carnes, W. R. Scarborough and J. E. Stucky, all of Sumter, S. C., are incorporators.

SUNNYSIDE RAILROAD.—Incorporated in the state of Washington to build from Toppenish, Wash., on the Northern Pacific, southeasterly to Sunnyside, and thence to a point near Prosser, 30 miles. F. H. Gloyd and F. L. Pitman, of Prosser, Wash., and C. E. Woods and S. J. Harrison, of Sunnyside, are incorporators.

SUPERIOR & SOUTHEASTERN.—Extension 45 miles in a southeasterly direction into northern Wisconsin. Proposed. J. E. Glover and L. A. Baker, of New Richmond, Wis., are interested.

SUSQUEHANNA & NEW YORK.—Extension from Grays Run south to Newberry Junction, on the Pennsylvania Division of the New York Central, 18 miles. The line will probably be built on the west branch of Lycoming Creek. Plans under way.

SUSQUEHANNA RIVER & WESTERN.—Reconstruction of this line, which was formerly the Perry County R. R., from Duncannon, Pa., to Landisburg, 23 miles. Work to begin soon. David Gring is President. (Mar. 11, 1904.)

SUWANEE & SAN PEDRO.—Preliminary surveys completed for an extension from Perry, Fla., to Springhill, 50 miles. R. N. Ellis, Jr., Live Oak, Fla., is Chief Engineer.

——Branch from Mayo, Fla., to Stephensville, 30 miles. Surveyed. (Mar. 11, 1904.)

SWAINSBORO & STATESBORO.—Incorporation asked by this company to build from Swainsboro, Ga., via Summit, to Statesboro, 40 miles. A. A. Turner and J. D. Overstreet, of Summit, are interested.

T

TACOMA TERMINAL.—Incorporated in Washington, to build a belt line 10 miles long around the city of Tacoma. J. W. Lynch is President, and E. L. Roberts, Vice-President, both of Tacoma, Wash. (Mar. 11, 1904.)

*TALLULAH FALLS.—Contract let for an extension from Clayton, Ga., to Franklin, N. C., 24 miles. W. S. Erwin, Cornelia, Ga., is General Manager.

TAYLORSVILLE, WILKESBORO & NEWTON.—Proposed line from Wilkesboro through Taylorsville to Newton, 30 miles. Chartered. W. C. Flimstay, Newton, and F. C. Henderson, Wilkesboro, N. C., are interested. (Mar. 11, 1904.)

TENNESSEE & GEORGIA INTERURBAN (Electric).—Preliminary survey about to be made from Chattanooga via Chickamauga Park and New Army Post to Ringgold, 25 miles. Projected extension later to Ducktown, Tenn., or Atlanta, Ga. S. W. Devine, Chattanooga, is interested.

*TENNESSEE CENTRAL.—Contract let to W. J. Oliver & Co., of Knoxville, Tenn., for building branch from Ozone, Tenn., along Fall Creek to the coal fields of the Tennessee Coal & Lumber Co., four miles. Work to be begun at once.

——*Announced that $500,000 will be spent on improvements. Plans include a $40,000 freight house and yards at Nashville, Tenn., work to be begun soon; additions to the Belt Line in and about Nashville, contract reported let to M. N. Elkan, of Knoxville, Tenn.; a car ferry across the Cumberland River and reballasting of the Hopkinsville Division of the road.

——Plans reported for an extension from Harriman, Tenn., to Kingston, eight miles. Rights of way are being secured and final surveys will shortly be begun.

——*Crawford branch extension 15 miles long, to the new coal properties of the Fentress Coal & Iron Co., in Fentress County, Tenn. Built to Wilder, seven miles. J. J. Condon, Knoxville, Contractors.

——Branch from Crossville, Tenn., to the Laurel Creek coal fields, 18 miles. Projected. (Mar. 11, 1904.)

TENNESSEE, GEORGIA & SOUTH CAROLINA (Electric).—Articles of incorporation filed by this company in Georgia. Proposed to build from Clayton, in Rabun County, Ga., west through Union and Fannin counties to Ducktown, Tenn., and thence through Walker County to Chattanooga. Merrill Skinner, Blue Ridge, Ga., is said to be interested.

TENNESSEE INDUSTRIAL RAILROAD.—Chartered in Tennessee, to build from a point on the Cumberland River, near the mouth of Harpeth River, to Clifton, 70 miles. J. D. Parish, W. M. Shipman and W. L. Cooke are incorporators. (Mar. 11, 1904.)

*TENNESSEE RAILROAD.—Contract let to Eskridge & Carroll for building this road from Paint Rock Creek, Tenn., to the New River, 5½ miles. The line will eventually be built to Oneida. Work already begun. J. D. Roberts, Harriman, Tenn., is interested.

TENNESSEE ROADS.—Proposed line from South Pittsburg, Tenn., on the Jasper branch of the Nashville, Chattanooga & St. Louis, northeast to Lancing, 90 miles. Surveys reported in progress between Crossville and Lancing. (Mar. 11, 1904.)

TENNESSEE WESTERN.—Incorporated in Tennessee, to build from Humboldt via Alamo to Dyersburg, 60 miles. Preliminary surveys in progress. J. H. Connor, Nashville, is interested. (Mar. 11 1904.)

*TEXAS & GULF.—Charter filed in Texas to build from Timpson to a point on the Gulf of Mexico, about 150 miles, and also to a point on the northern border of the State of Texas, about 100 miles. Grading completed from Timpson south 20 miles. The Grigsby Construction Co. are the contractors.

——Surveys made for an extension from Longview, Tex., north to a point near Marshall, 17 miles.

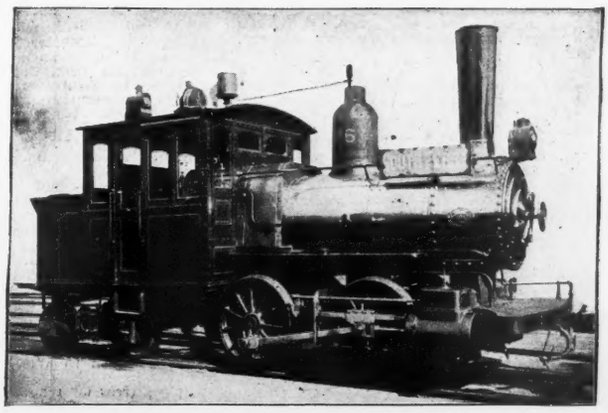
——Extension of Marshall & Sabine Pass, purchased, from Timpson east to Center, 15 miles. Proposed.

*TEXAS & PACIFIC.—Work in progress on second track from Fort Worth, Tex., to Dallas, 32 miles.

TEXAS CENTRAL.—Surveys reported in progress for an extension from Stamford, Tex., northwest to Amarillo, 190 miles.

*TEXAS NEW MEXICO & WESTERN.—New line from Dallas, Tex., west to Roswell, N. Mex., 300 miles. Contract for grading reported let. E. P. Spears, Dallas, Tex., is President, and M. J. Healey, General Superintendent. (Mar. 11, 1904.)

TEXAS ROADS—Northern Texas Construction Co. organized to build 750 miles of railroad in the western part of Texas. Main line projected from Amarillo to San Antonio, 450 miles, with a branch line from Amarillo to El Paso, 300



Contractors and Railroads—Attention

New York Elevated R. R. has a number of excellent Forney type engines for sale, 4 ft. 8½ in. gauge. Desirable for Suburban, Logging, Plantation, Contractors, Switching and light railroad service generally.

Locomotives, new and second hand; all types, weights and gauges.

Cars, passenger, box and flat; new and rebuilt.

Rails, all weights; angle and plain plates; bolts and nuts; frogs and switches; spikes, etc.

BENJAMIN WATSON,

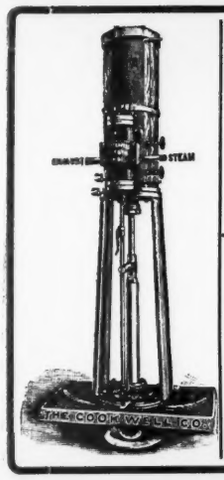
Coffee Exchange Bldg. 66-70 Beaver St., New York.

RELAYING RAILS

BOUGHT AND SOLD

BLOCK-POLLAK IRON CO.

MARQUETTE BLDG. - - - CHICAGO



THE COOK WELL CO.

15 S. Fourth Street, St. Louis, Mo., U. S. A.

CONTRACTORS FOR WATER WORKS, FOR RAILROADS, MANUFACTORIES AND CITIES

Patentees of

COOK'S SYSTEM of TUBE WELLS

Manufacturers of Cook's Patent Tube Well Strainers, Cook's Deep Well Pumps and Well Sinking Tools

WELL SUPPLIES OF EVERY DESCRIPTION

RAILROADS USING OUR SYSTEM

Union Pacific Ry.
Chicago, Kansas & Nebraska Ry.
St. Joseph & Grand Island R. R.
Kansas City & Omaha R. R.
Fremont, Elkhorn & M. Valley R. R.
Burlington & Missouri River R. R.
Evansville & Terre Haute R. R.
Peoria, Decatur & Evansville R. R.
Missouri Pacific R. R.
Atchison, Topeka & Santa Fe R. R.
Louisville, N. O. & Texas R. R.
Grand Tower & Cape Girardeau R. R.
Chesapeake & Ohio R. R.
Louisville & Nashville R. R.
Illinois Central R. R.
Chicago & Alton R. R.
Chicago & North-Western R. R.
Wabash R. R.
C., C., C. & St. L. R. R.
Chicago & Eastern Illinois R. R.
Southern Pacific R. R.
Sioux City & Pacific R. R.
Humeston & Shenandoah R. R.
Toledo, St. Louis & Kansas City R. R.
K. C., Ft. Scott & Memphis R. R.
K. C., Memphis & Birmingham R. R.
Mobile & Ohio R. R.
Chicago, Rock Island & Pacific R. R.
Chicago, Burlington & Quincy R. R.
Chicago & Erie R. R.
Great Northern Ry.
Yazoo & Mississippi Valley Ry.
St. L., Iron Mountain & Southern Ry.
St. Louis South-Western Ry.
St. Louis & San Francisco Ry.
Toledo, St. Louis & Western Ry.
Louisville, Henderson & St. L. Ry.
Dela., Lackawanna & Western Ry.
Texas Pacific Ry.
El Paso & North-Eastern Ry.
Galveston, Harrisburg & San Antonio Ry.

MORGAN T. JONES, President
Inspecting Engineer.

I. A. FOULKS, C. E.
RICHARD SCHERMERHORN.

E. B. WILSON, M. Am. Soc. C. E.,
Secretary and Treasurer

The American Bureau of Inspection and Tests

29 Broadway, New York Monadnock Block, Chicago Pittsburg, Cleveland

FIRST CLASS INSPECTION OF ALL KINDS OF RAILROAD MATERIALS

miles. C. L. Townridge, Chicago, is reported interested.

——Reported that a railroad is about to be built from Velasco, Tex., to San Antonio, about 225 miles. J. W. Gates and L. J. Polk, formerly First Vice-President of the Gulf, Colorado & Santa Fe, are said to be interested.

——Charter granted to the San Saba Construction Co., Abilene, Tex., to build from Abilene to Llano, 200 miles.

——Reported that a railroad will be built from Waring northwest to Fredericksburg, 40 miles. W. W. Kidd and L. W. Van Horn, Oklahoma City, Okla. T., are said to be interested.

——Projected logging roads from Deweyville northwest, 35 miles, and from Orange to Echo, six miles. Rights of way secured by the Sabine Lumber Co. (Mar. 11, 1904.)

*TEXAS SOUTHEASTERN.—This company, whose road runs from Diboll, Tex., to Diboll Junction, 13 miles, is reported to have let a contract to Charles McSweeney, Houston, Tex., for grading a nine-mile extension.

THEBES BRIDGE & WESTERN.—Incorporated in Missouri, to build from the Mississippi River in Scott County, Mo., to the Caster River in Stoddard County, 35 miles. S. M. McCoy and V. O. Boone, of Benton, Mo., are incorporators.

*THOMASVILLE & DENTON.—Contract reported let to E. L. Probst & Co., of Charlotte, N. C., for building the first seven miles of this proposed road from Thomasville, N. C., south to Denton, 15 miles. Milton Jones, of Thomasville, is President.

THORNTON & ALEXANDRIA.—Chartered in Arkansas to build from Thornton in a southeasterly direction wholly within Calhoun County. C. W. Green and H. C. Black, of Thornton, Ark., are interested.

TIDEWATER RAILROAD.—This company, which is a project of the Deepwater Railroad, proposes to build from a point on the western boundary of Virginia, where Mercer County, W. Va., joins Giles County, Va., via Roanoke, to Norfolk, 350 miles, paralleling the Norfolk & Western. The entire route has been surveyed and bids for grading and masonry on 20 sections of five miles each, west from Norfolk, will be received until April 15. The City Council of Norfolk has voted to appropriate, $95,000 to secure for the road a right of way 13 miles long, from the southern branch of the Elizabeth River to Sewall's Point. William N. Page, Ansted, W. Va., is President and C. P. Howard, Chief Engineer.

——See Deepwater Railroad.

*TOLEDO & INDIANA (Electric).—Work now in progress on an extension from Wauseon, Ohio, to Bryan, 23 miles. Patrick Hirsch Construction Co., Toledo, are the contractors. D. H. Lavenberg, Delta, Ohio, is Chief Engineer.

TOLEDO & JACKSON (Electric).—Surveys being made and rights of way secured from Jackson, Mich., to Petersburg, 48 miles. S. A. Foster, Toledo, Ohio, is said to be interested.

*TOLEDO & MICHIGAN (Electric).—Incorporated to build from Adrian, Mich., via Clayton, Hudson, Hillsdale, Jonesville and Quincy, to Coldwater, 56 miles, all under contract. Grading completed from Adrian to Hudson and from Coldwater to Jonesville, 35 miles. P. P. Duket, Adrian, Mich., may be addressed.

TOLEDO & POINT PLACE.—Incorporated in Ohio by John A. Dunn, William R. Leflet and others, of Toledo.

TOLEDO CENTRAL STATION (WABASH).—Incorporated in Ohio in the interest of the Wabash, to build a line 4½ miles long at Toledo, connecting the tracks of the Wheeling & Lake Erie and the Ann Arbor with the Wabash. It will also build a large union passenger station. A. L. Smith, Toledo, Ohio, is President. (Mar. 11, 1904.)

*TOLEDO, ANN ARBOR & DETROIT (Electric).—This road, from Toledo, Ohio, across the Michigan state line and via Lambertville, Milan, Petersburg and Dundee to Ann Arbor, Mich., 55 miles, is under contract to the Patrick Hirsch Co., of 35 St. Clair Building, Toledo. J. H. Clauss, of Fremont, is President.

TOLEDO, COLUMBUS & CINCINNATI (Electric).—Incorporated in Ohio, to build an electric railroad from Cincinnati north through Columbus and Lima to Toledo, 250 miles. Construction work expected to be begun this spring. E. C. Schumess, President, and T. A. Wright, Secretary, Spitzer Building, Toledo.

TOLEDO, MARSHALL & NORTHERN.—Mortgage for $4,000,000 filed by this company; the proceeds to be used in building a road from Bay City, Mich., southwest to Montpelier, Ohio, 150 miles, using the old roadbed of the Marshall & Coldwater.

TOLEDO NORTHWESTERN (Electric).—Incorporated in Ohio to build from Toledo northerly through Lucas County. C. W. Merrill, H. C. Adams and R. W. Barton, of Toledo, are incorporators.

TONOPAH.—This line from Rhodes, Nev., to Tonopah, 61 miles, which was completed last July and is 36-in. gage, will be made standard gage, work to be completed in June. This, with the Goldfield Railroad, will make a through line from Rhodes via Tonopah to Goldfield, 92 miles. R. W. Welsh is Chief Engineer.

——See Goldfield Railroad.

TONOPAH & TIDEWATER.—Incorporated in New Jersey with an authorized capital stock of $1,000,000. Proposed location not stated. F. M. Smith, Oakland, Cal., may be addressed.

TOPEKA, FRANKFORT & NORTHWESTERN.—To run from Topeka, Kan., northwest through the counties of Shawnee, Jackson, Pottawatomie and Marshall to Frankfort, 60 miles. Beginning of work authorized by the stockholders. P. L. Wise, Topeka, Kan., is Chief Engineer.

TORONTO, HAMILTON & BUFFALO.—$1,000,000 of debenture stock voted, the proceeds to be used in improving the road.

TORRANCE, ROSWELL & GULF (SANTA FE CENTRAL).—Incorporated in New Mexico by William H. Andrews, Albuquerque, N. Mex.; Willard S. Hopewell, Hillsboro, N. Mex., and Arthur Kennedy, of Pittsburg, Pa., to build from Torrance, on the Santa Fe Central, southeast 100 miles to Roswell, on the Pecos Valley & Northern. Surveyed.

TRANS-ALASKA RAILROAD.—Bill introduced in the United States Senate to incorporate this company with a capital stock of $10,000,000, and to have the Federal Government guarantee the interest on its bonds at a rate not exceeding 4 per cent. to the extent of $40,000 a mile. The projected route of the line is from Valdez, on the Copper River, northeast to Eagle City, on the Yukon River, 500 miles. The incorporators are Henry Bratnober, of California; Charles F. Manderson, of Nebraska; George W. Holdrege, of Nebraska; George C. Hazlet, of Alaska, and William Tod, of New York.

TREMONT & GULF.—Contracts to be let for the first eight miles of an extension from Eros, La., to Alger, 16 miles. The work will include several trestles. W. G. Collar, Tremont, La., is Vice-President and General Manager.

TRINITY & BRAZOS VALLEY.—Proposed extension in 1905 from Mexia, Tex., 300 miles into southeastern Texas, probably to Beaumont and Houston.

*TUSCALOOSA BELT.—Extension from Tuscaloosa, Ala., to Holton, 5 miles. Contracts for grading let to Wm. Troxey and Guy Hard. Work to be begun at once. (Mar. 11, 1904.)

U

*UNION & GLENN SPRINGS.—Work in progress from a point on the Seaboard Air Line near Carlisle, S. C., to Union, 17 miles. W. J. Oliver, Knoxville, Tenn., is the contractor. Grading completed and 10 miles of track laid, and four miles in operation.

——Preliminary surveys in progress for a branch line from Buffalo, S. C., to Spartanburg, 25 miles. G. M. W. Wright, Union, S. C., is General Manager.

UNION CITY, WESTCHESTER & MUNCIE TRACTION.—Incorporated in Indiana to build an electric interurban line from Union City, Ind., west to Muncie, 30 miles. W. B. Gebhard and Theo. Shockney, of Union City, are incorporators.

*UNION PACIFIC.—Building of the Topeka & Northwestern from Menoken, Kan., to Onaga, 37.37 miles, under contract to Kilpatrick Bros., of Beatrice, Neb.

——*Contract for double-tracking the main line from Kansas City to Topeka, Kan., 67.36 miles, let to W. C. Bradbury, Railroad Building, Denver. Grading will be begun early this spring.

——This company, it is reported, will extend to Altamont its branch which runs from Kemmerer, Wyoming, to Cumberland. Altamont is on the main line west of the Spring Valley tunnel.

*UNION RAILROAD.—Spur from Duquesne, Pa., to the mines of the Mifflin Coal Co. Surveys completed and grading begun by the company's forces. Further extension to a connection with the Wabash probable. E. C. Brown, Port Perry, Pa., is the engineer in charge.

UNION SPRINGS & NORTHERN.—New line in Alabama from Union Springs, via Fort Davis, Milsted and Rockford, to Birmingham, 116 miles. Eight miles between Union Springs and Fort Davis in operation, and extension from Fort Davis to Rockford, 74 miles, surveyed. Wm. Blount, Union Springs, Ala., is President. (Mar. 11, 1904.)

UNION TERMINAL.—Incorporated in Ohio, with a capital of $100,000, to build a belt line in and about Cincinnati. O. J. Cosgrove and J. H. Woodward, of Cincinnati, are incorporators.

V

VALDEZ & NORTHERN.—Incorporated to build from Valdez, Alaska, along the Lowe River, through Keystone Canyon to the summit of the Coast Range Mountains and thence along Copper River to Eagle City, on the Yukon, approximately 413 miles. Alfred B. Iles, Valdez, Alaska, is interested.

*VALLEJO, NAPA & BENICIA (Electric).—Grading practically completed on this road from Vallejo, Cal., north to Napa, 15 miles. Track laying is to be begun at once. The line is to be eventually extended to Benicia. J. W. Hartgell, Oakland, Cal., may be addressed.

*VANCOUVER, VICTORIA & EASTERN (GREAT NORTHERN).—Grading is completed on the extension from Grand Forks, B. C., northwest to Phoenix, 24 miles, with a branch to Granby Smelter, 6½ miles. Porter Bros., of Phoenix, B. C., have the contract for the track laying and bridges. James H. Kennedy is Chief Engineer.

——An extension is proposed from Midway, B. C., to Oroville, Wash. Surveyed.

VANCOUVER, WESTMINSTER & YUKON (GREAT NORTHERN).—Reported that a line will be built from North Vancouver through Le Clovet, to connect with the Grand Trunk Pacific and Canadian Northern in the northern part of British Columbia.

*VERA CRUZ & PACIFIC.—Contract let to Woodhouse & Hardie for building the culverts and retaining walls along the main line. Much masonry work will be removed and replaced by first class material. Reported that Hampson & Smith, of the City of Mexico, will furnish the stone ballast for the line and will immediately establish a rock crushing plant at Penuelos, a short distance from Cordova. Thomas Milan is President.

VINCENNES, WASHINGTON & EASTERN (Electric).—Incorporated in Indiana, with authorized capital of $1,000,000, to build from Washington west to Vincennes, 20 miles. A. F. Caleb, F. E. Hakeman and H. T. Trueblood, of Washington, Ind., are incorporators.

VINITA & NORTHWESTERN.—Surveys in progress for this road, which is projected from Vinita, Ind. T., north to Timber Hill and northwest to Coffeyville, Kan., a total of about 70 miles. R. A. McClellan is interested.

*VIRGINIA & SOUTHEASTERN.—Chartered in Virginia to build a railroad to afford an outlet for the products of the Virginia Iron, Coal & Coke Co., from a point on the Tennessee and Virginia state line through the counties of Lee, Wise, Scott, Dickenson, Russell, Washington, Smyth, Tazewell, Bland, Giles and Wythe, about 300 miles. Authorized capital, $10,000,000. Work reported begun on line from Norton, Va., to Stonega, 20 miles. G. B. Schley, 80 Broadway; H. K. McHarg, 40 Wall Street, New York, and D. D. Hull, Jr., Bristol, Va., are incorporators.

VIRGINIA & SOUTHWESTERN.—Surveys reported for a line from Tom's Creek, Va., southwest to Clinchport, 38 miles. E. P. Fraser, Bristol, Tenn., is Chief Engineer.

——Branch from Elizabethton, Tenn., southwest to Oklahoma, 12 miles. Surveys in progress. (Mar. 11, 1904.)

VIRGINIA ROADS.—Reported that an electric road will be built from Big Stone Gap, Va., via Stone, Appalachia and Norton to Wise, 30 miles.

——*Work reported in progress on a new line to the iron properties of James A. Frazier near Rockbridge Alum Springs. (Mar. 11, 1904.)

——Narrow gage line, 25 miles long, from a connection with the Southern into timber lands in Lunenburg County, owned by Miller & Miller, Richmond, Va. Projected. (Mar. 11, 1904.)

W

WABASH.—Reported that this company is planning to build the following lines this year: From Lisbon, Ohio, west to Minerva, 20 miles; north to Washingtonville, 10 miles; from Negley southwest to the Ohio River at Wellsville and East Liverpool, 10 miles, and from New Galilee, Pa., northeast to Ellwood City, six miles, and northeast to Newcastle, 20 miles. In addition, nearly $400,000 will be spent for an entrance into Youngstown, Ohio.

——Reported that Greene County line from Pittsburg to Bellington, W. Va., 120 miles, will be built. Surveys completed and rights of way secured. J. W. Patterson, Jr., Pittsburg, Pa., is in charge of the work.

——For extension from Zanesville, see Wheeling & Lake Erie.

——See Parkersburg Bridge & Terminal.

——See Toledo Central Station.

——See Wabash Pittsburg Terminal.

——See Western Maryland.

*WABASH & ROCHESTER (Electric).—Grading under way from Wabash, Ind., to Rochester, 36 miles, and track laying to begin at once. W. H. Wiley, Wabash, Ind., is in charge of the work.

WABASH PITTSBURG TERMINAL (WABASH).—Proposed elevated line along Duquesne Way from Fourth Street to a junction with the Pennsylvania R. R. tracks under the Fort Wayne Bridge at Pittsburg.

WAPSIE VALLEY (Electric).—Incorporated in Iowa to build a number of electric lines from Independence, Iowa, in a northwesterly and northerly direction. H. J. Wyanhoff is President, and I. W. Goen, Secretary, both of Tripoli, Iowa.

*WARE SHOALS.—Contract awarded to A. Bramlett and J. R. Gallagher, of Laurens, S. C., for building this road from Barmore to Ware Shoals, four miles. Grading to be begun at once.

WARM SPRINGS RAILROAD.—Charter granted to build from a point on the Potomac River in Washington County, Md., to a connection with the Baltimore & Ohio at Berkeley Springs, W. Va. T. B. Dawson, A. M. Mendenhall and G. W. Biser, Berkeley Springs, are incorporators. (Mar. 11, 1904.)

WASHINGTON & GREENE.—Surveys reported in progress for this standard gage road from the Monongahela River to the Ten-Mile Coal Field. R. M. McKinney is in charge of the surveys.

WASHINGTON & PACIFIC.—New line from Orondo, Wash., via Waterville, to Buckingham, 70 miles. Surveys completed and contracts for grading will be let soon. H. L. Phillips, Seattle, Wash., is Chief Engineer. (Mar. 11, 1904.)

WASHINGTON & STATE LINE.—Charter granted in Pennsylvania, to build from Tylerdale, a point near Washington, west to Dunsfort, 10 miles. (Mar. 11, 1904.)

WASHINGTON & VANDEMERE.—Press reports state that surveys are in progress for this proposed road from Washington, N. C., southeast to Vandemere, 40 miles. R. T. Bonner, Aurora, N. C., may be addressed.

WASHINGTON CENTRAL.—Incorporated in Washington, with an authorized capital of $500,000, to build from a point near Grays Harbor, in Chehalis County, Wash., in an easterly direction through Chehalis, Lewis, Thurston and Yakima counties. G. E. Long and M. D. Sayles, of Portland, Ore., and E. V. Bloomfield, of Centralia, Wash., are named as incorporators.

WASHINGTON RAILROAD (OREGON RAILROAD & NAVIGATION).—Articles of incorporation filed at Portland, Ore., by E. E. Calvin, General Traffic Manager of the Southern Pacific; William Crooks, J. C. Havely and Charles Steele, to build this branch of the Oregon Railroad & Navigation Co. by extending the branch from Pomeroy, Wash., to Vineland or Clarkston, on the Snake River, just across from Lewiston, Idaho. The projected road also contemplates a junction with another road to be built up the Clearwater River from Lewiston to Grangeville and Mount Hope, as well as the building of a road up the south or middle fork of the Clearwater River to the Montana line. The company is reported also to have plans for building a road from Touchet to Prescott, in Walla Walla County; from Dayton south to the Oregon line, in Columbia County, and a line

FROM EXPLOSION IS MINIMIZED WHERE

Nitro Powders

ARE USED

The Ideal Explosives. Will not Freeze above 35° F. Do not throw off as great quantities of fumes as other powders.

Safe to handle because they contain only half the quanity of Nitro-Glycerine that other powders contain.

Read what the largest consumer of Dynamite in the State of Colorado says about them

STRATTON'S INDEPENDENCE LTD.

CRIPPLE CREEK DISTRICT, COLORADO.
THOMAS CORNISH, Manager. Victor, Colorado.

VICTOR, COLORADO, April 29, 1903.

The Batopilas Mining Co., 45 Broadway, New York.

Gentlemen—We are in receipt of yours of the 25th, regarding the merits of Nitro Plastine Powder, which has our attention.

We have used 40 per cent. Nitro Plastine Powder for the last five months, and have found it the most satisfactory powder we have ever used on the property.

We are using this powder in conjunction with double tape Climax fuse and Repauno quadruple (the best) caps, and in the whole five months, have not had a missed shot that we could trace to the powder.

Our ground is quite hard in many parts of the mine, and Mr. Cornish, our Manager (who has been mining for 35 years), states that the powder pulverizes better than any powder he has used, and we get better values from our ore through screenings and having less rock to sort with the chances of quite a little of it going over the dump.

We have never met the makers of this powder, and their agent, Mr. A. A. Maclean, of Denver, got our order for the powder after a very severe test and much opposition from their competitors, so that it stands strictly on its merits.

Of course, as we use a ton a day, if we could find a better powder, for the same money, or as good a powder for less, we would certainly use it.

Any further information we shall be pleased to give.

Yours truly, W. W. TRAVELL, Purchasing Agent.

THE BATOPILAS MINING COMPANY

HACIENDA DE SAN MIGUEL Y SAN ANTONIO.
A. B. C. Codes. BATOPILAS, CHIHUAHUA, MEXICO, Dec. 7, 1904.

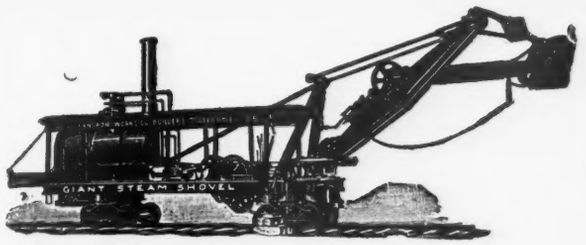
Mr. E. R. Dalby, Auditor, Candelaris Mining Co., El Paso, Texas.

Dear Sir:—In reply to your letter of inquiry regarding Nitro Powder, dated Nov. 25, would say that we are well pleased with this powder; finding it fully equal in efficiency to any 60 per cent. powder we have used heretofore, and while comparing favorably in cost, it is a much more desirable powder for mine use on account of the smoke, which is no where near as bad as that from other kinds we have been accustomed to.

If there is a better mining powder made we have yet to find same.

Truly yours, THE BATOPILAS MINING COMPANY,
(Signed) A. R. SHEPARD, JR., Assistant General Manager. S.

NITRO POWDER CO., Kingston, N. Y.



Contractors' Appliances

1 9-ton 30″ gauge Saddle-tank Locomotive.
1 8-ton 36″ " " "
1 9-ton 36″ " " "
1 12-ton 36″ " " "
1 15-ton 36″ " " "
1 40-ton standard gauge Mogul Locomotive.
1 40-ton standard gauge Passenger Locomotive.
1 19½″x20″x24″ McKiernan Compressor.
1 14″x14″x18″ Hall Compressor.
1 14″x14″x14″ Hall Compressor.
1 1¼-yd. Bucyrus Shovel.
2 2-yd. Souther Shovel.
1 1½-yd. Barnhardt Shovel.

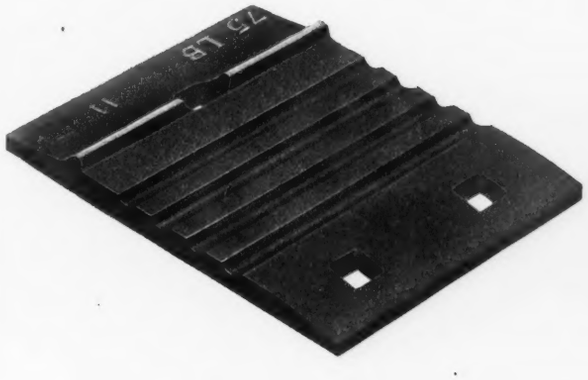
LOT OF

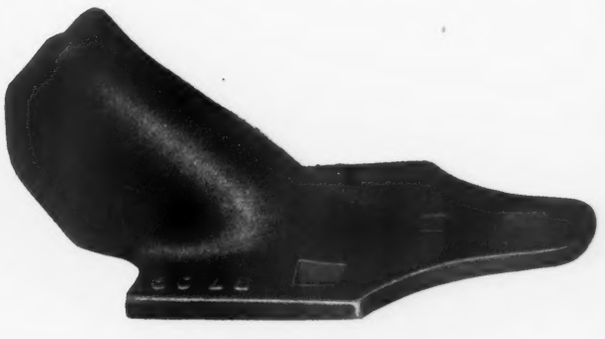
Fine Engines, Boilers, Pumps, Dump Cars, Concrete Mixers, Pipe, Rails, Etc., Etc.,

THOMAS P. CONARD

119 South Fourth St. PHILADELPHIA, PA.

Malleable Iron Tie Plates and Braces





Stronger than Rolled Steel and Last Longer

BEAVER DAM MALLEABLE IRON CO.

BEAVER DAM, WIS.

LAWRENCE FITCH, Sales Agent, Old Colony Bldg., Chicago

HAS STOOD TEST OF TIME

Szerelmey Stone Liquid

The Result of Experience and Research
Extending Over More Than Half-a-Century

Extensively Used Throughout Europe
Approved and Used by United States
Government Engineers

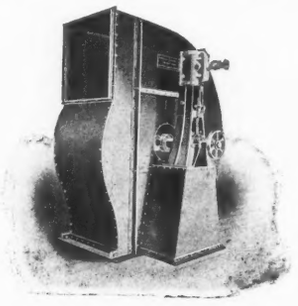
WATERPROOFS, WITHOUT DISCOLORING:
Concrete, Stone, Brick, Cement, Plaster

American Agency

SZERELMEY & COMPANY
Home Life Bldg., Washington, D. C.

"A. B. C."

Fan System of Heating for Shops and Roundhouses



Mechanical Draft Apparatus for Power Plants

Fans and Blowers for All Purposes

CATALOGUES ON REQUEST

AMERICAN BLOWER COMPANY, = Detroit

New York Chicago Atlanta

EUROPEAN BRANCH, 70 GRACECHURCH STREET, LONDON

from Pendleton, Ore., south to the head of Birch Creek.

*WASHINGTON ROADS.—The Eastern Washington Construction Co., a company organized in Washington with a capital of $500,000, has finished a survey for a railroad from Farmington, Wash., southeast to Princeton, Idaho, 20 miles, and has secured most of the rights of way. A contract has been made with the town of Farmington to build the road within two years from Farmington to Princeton. From Princeton the road will be extended to Leland, Idaho. J. H. Abbott is President; W. J. Nichols, Secretary, and E. Tappan Tannatt, Chief Engineer, all of Spokane.

——*The Northwest Coal & Coke Co. will build a line 17 miles long to connect its new coal fields with the Crow's Nest Division of the Canadian Pacific. Contract for grading let to Donald McLeod, of Nelson, B. C. (Mar. 11, 1904.)

——The Portland Coal & Coke Company will build a railroad 60 miles long from Stella, Wash., to its coal properties in Lewis County. (Mar. 11, 1904.)

——*Contract let to W. R. Robb & Co. for building 12 miles of railroad from Darrington, Wash., to the mines of the Copper & Gold Mining Co., at the head of Clear Creek. Work will be begun at once and will include one tunnel 500 ft. long. C. G. Austin is Vice-President and General Manager. (Mar. 11, 1904.)

——Proposed line from a point near Jansville, Idaho, west, to connect with the Northern Pacific and the Oregon Railroad & Navigation Co. at Garfield, Wash., 30 miles. Wm. Deary, Spokane, Wash., may be addressed. (Mar. 11, 1904.)

——Logging road in the vicinity of Montesano, Wash., to open up property owned by the Frank H. Lamb Timber Co., which operates a camp on Black Creek, a branch of the Wonooche, four miles from Montesano. Proposed. (Mar. 11, 1904.)

WAYNESBORO & SAVANNAH VALLEY.—Application for charter to build from Waynesboro, Ga., through Sylvania, Mill Haven and Bevell to Clyo, on the Seaboard Air Line, about 60 miles. W. A. Wilkins, Jr., F. M. Kates and G. O. Warnock, of Waynesboro, Ga., are interested.

WEBSTER & VEBLEN.—Incorporated in South Dakota, with headquarters at Grenville, S. Dak., to build from Webster, in Day County, to Veblen, in Marshall County, 50 miles. R. O'Conner and F. A. Dabney, Grenville, S. Dak., are among the incorporators.

WELLSBURG & BUFFALO VALLEY.—Chartered in New Jersey, with an authorized capital of $1,000,000, to build and equip railroads. A. E. Anderson and E. F. Hubbard, of Jersey City, are incorporators.

*WELLSBURG & STATE LINE.—From Pitts Run to the Pennsylvania state line, nine miles, reported under construction. From this point, under the name of the Washington & State Line Railroad, building to be continued 15 miles to Washington, Pa. Joseph A. West, Wellsburg, W. Va., is interested.

WESTERN ALLEGHENY.—Projected road from Queen Junction, on the Bessemer & Lake Erie, west to Newcastle, Pa., 28 miles. Reported that work will shortly be begun.

*WESTERN ILLINOIS.—New line in Illinois from Dahinda, in Knox County, through Etherly and Toulon to the Illinois River, 60 miles. Nine miles out of Etherly graded. L. B. Fuller, 25 North Lincoln Street, Chicago, is Chief Engineer. (Mar. 11, 1904.)

*WESTERN MARYLAND (WABASH).—Connection between the Western Maryland at Cherry Run, W. Va., and the West Virginia Central, at Cumberland, Md., 65 miles. Contracts let to Degnon-McLean Contracting Co., New York; McArthur Bros., Chicago, and Kilpatrick Bros., Chicago. Completed from Cherry Run east to Hancock, Md., 10 miles. Rest of work in progress. Reported that $18,000,000 will be spent on improvements to these two roads, including reconstruction of the main line of the Western Maryland between Baltimore and Hagerstown.

——Extension from York, Pa., to Northbrook, one mile, and from York to Louck's Mill, two miles. Rights of way being secured, and surveys will soon be begun.

WESTERN OF ALABAMA.—Proposed line from Tallassee through Elmore and Coosa counties, Alabama, about 40 miles. Rights of way reported secured.

*WESTERN PACIFIC.—New line from San Francisco, via Sacramento, Oroville and Marysville through Beckwith Pass to Salt Lake City, Utah. Main line 810 miles, with 440 miles of branches in California. Contracts reported let for most of the construction and work to begin shortly. The company is capitalized at $30,000,000. W. J. Barnett, San Francisco, is President, and E. T. Jeffery, President of the Denver & Rio Grande, Vice-President.

WESTERN RHODE ISLAND.—Incorporated to build from Croweset Bay, through Apponaug, Crompton, Anthony, Hope, North Scituate, Harmony and Chepacket to Burrillville, 30 miles. Geo. W. Prentice, James S. Kenyon and Franklin P. Owen, Providence, R. I., are interested. (Mar. 11, 1904.)

WEST FORK BELT.—Incorporated in West Virginia to build in Harrison County from a point near Meadowbrook on the West Virginia Short Line to a point near Bloom. J. W. Jacobs, C. H. Jenkins and J. M. Brownfield, of Fairmont, W. Va., are incorporators.

WEST FORK & VALLEY RIVER.—Incorporated in West Virginia to build from Clarksburg northeast to Grafton, 20 miles, paralleling the Baltimore & Ohio. Gordon B. Lake and C. H. Warmer, of Bridgeport, Harrison County, and R. G. Altizer, of Clarksburg, are incorporators.

WEST MICHIGAN INTERURBAN.—Incorporated in Michigan, with a capital stock of $1,000,000, to build an electric road from Grand Rapids to Hart, in Oceana County, via Muskegon, 65 miles. E. H. Cross, Grand Rapids, is Chief Engineer. F. A. Nims, Muskegon, and J. K. Flood, Hart, Mich., are incorporators.

*WESTMORELAND CENTRAL.—New coal line from Ligonier, Pa., to Bolivar, 14 miles. Work in progress. O. E. Hallam, Pittsburg, is President. (Mar. 11, 1904.)

WEST VIRGINIA & IRONTON.—Incorporated in West Virginia, it is reported, in the interest of the Norfolk & Western, which company plans, under the name of this new company, to straighten its line between Vivian, W. Va., and Naugatuck, 92 miles.

WEST VIRGINIA HILLS.—Charter granted in West Virginia to build from Powells, Marion County, to Buckhannon, 30 miles. W. J. Roderick and F. P. Mills, Robson, W. Va., and W. O. Wickoff, Flemington, W. Va., are incorporators. (Mar. 11, 1904.)

WEST VIRGINIA INTERIOR.—Chartered in West Virginia to build from Steelton, Wetzel County, through Middlebourne to Salem, Harrison County, 50 miles. T. P. Jacobs, New Martinsville, W. Va., is said to be interested.

*WEST VIRGINIA ROADS.—The Blue Creek Coal & Land Co., of which Charles H. Welles, C. S. Weston and H. W. Kingsbury, of Scranton, Pa., and J. W. Hollenback, of Wilkesbarre, are directors, is building 10 miles of road in West Virginia, and plans to extend the line 12 miles to the Elk River and down the Elk River to its junction with the Kanawha River at Charleston, 13 miles.

——The Cardiff Coal Co. will build a line 4¼ miles long, from the Powellton Branch of the Chesapeake & Ohio to one of its mines. (Mar. 11, 1904.)

——The Clinton Coal & Coke Company, Morgantown, W. Va., will build a railroad from Uffington to its mines, five miles. (Mar. 11, 1904.)

——The Roane Lumber Company, Weston, W. Va., is about to build a logging road from Arlington to timber lands in Webster and Nicholas counties. J. C. Roane, Weston, W. Va., is President. (Mar. 11, 1904.)

WHEELING & LAKE ERIE (WABASH).—Reconstruction of the line between Mingo and Toledo, Ohio. Proposed.

——*Extension from Zanesville, Ohio, under name of Zanesville, Marietta & Parkersburg, through Sharpsburg and Marietta to Parkersburg, W. Va., 70 miles. Grading has been completed for a distance of 10 miles. McArthur Bros., Chicago, are the contractors. S. D. Brady, Parkersburg, W. Va., is Chief Engineer. (Mar. 11, 1904.)

——Branch line from Darlington, Muskingum County, Ohio, on the proposed Zanesville, Marietta & Parkersburg, to the mines of the Northern Coal Company. Projected. (Mar. 11, 1904.)

——Extension of Steubenville branch north to Empire, Ohio, 14 miles, under name of Adena Railroad. Surveys. (March 11, 1904.)

*WHITE CASTLE & LAKE NATCHEZ.—This road is being built from White Castle, La., via Samstown and Junction Station, to Lake Natchez, 20 miles, by the White Castle Lumber & Shingle Co., of White Castle, La. Track is laid to within a mile of Lake Natchez.

WHITEHALL RAILROAD.—Incorporated in Illinois, with principal office at Whitehall, to build from Whitehall northeast to Coal City, 150 miles. J. P. Ground, Winchester, Ill.; J. S. Davis, Jacksonville, Ill., and H. C. Morrow, Whitehall, Ill., are incorporators.

WHITE RIVER VALLEY.—New line in Colorado, from Rifle Creek through the Coal Creek and Mill Creek valleys to a point on the Yampa River, 90 miles, where connection will be made with the Denver, Northwestern & Pacific. E. G. Kindred, Denver, Colo., is interested. (Mar. 11, 1904.)

*WICHITA, ARKANSAS VALLEY & DENVER.—New road from Pretty Prairie, Kan., northwest to Kinsley, 70 miles. The road is projected to extend eventually from Wichita, Kan., to Denver, Colo. F. M. Ceyes, Hutchinson, and C. A. Latham, Wichita, Kan., are interested. (Mar. 11, 1904.)

*WICHITA FALLS & RED RIVER.—Work in progress on this road from Wichita Falls, Tex., to Byles, 22 miles. The work includes the removal of 250,000 cu. yds. of embankment, one new station and a wooden trestle 540 ft. long. J. W. Field, Wichita Falls, Tex., is Chief Engineer.

*WICHITA VALLEY.—Extension from Wichita Falls, Tex., to Benvanue, 20 miles. Contract reported let to Manly Bros. J. W. Field, Wichita Falls, is in charge of the work. (Mar. 11, 1904.)

WILKESBARRE TERMINAL.—Chartered in Pennsylvania, to build from Wilkesbarre to Ashley, Luzerne County, Pa., 3½ miles. Surveys in progress. W. H. Smith, Jeddo, Pa., is President.

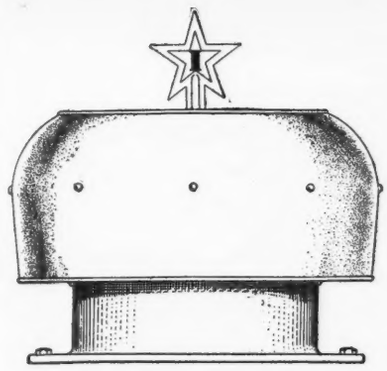
WILLAMETTE VALLEY ELECTRIC.—Incorporated in Oregon, with an authorized capital of $1,000,000, to build electric roads from Eugene, Ore., south to Cottage Grove, west to Corvallis, east to Blue River and north to Salem. J. F. Wilson and M. S. Taft are incorporators.

WILMAR & SALINE VALLEY.—Chartered in Arkansas to build from Wilmar to Bailey, in Drew County, 13 miles. E. W. Gates, A. H. Gates and H. C. Rule, of Wilmar, Ark., are incorporators.

WILSON NORTHERN.—Incorporated in Arkansas, with a capital stock of $100,000, to build a line from Wilson to Keiser, 10 miles. Both places are in Mississippi County. M. J. Blockwell and E. H. Green, Wilson, Ark., and Charles T. Coleman, Little Rock, are incorporators.

WINCHESTER & WASHINGTON (Electric).—Organized in Virginia to build an electric railroad from Washington, Va., north to Winchester, 30 miles. S. L. Hoover, Winchester, Va., may be addressed.

WINFIELD & SOUTHERN.—New line from Winfield, Kan., south to the coal fields of the Osage and Cherokee Nations. Surveys practically com-



Patent applied for.

"IMPROVED STAR"
CAST IRON
VENTILATOR

LIGHT WEIGHT
DURABLE
STORM-PROOF

For ROUND HOUSES, Foundries and all other buildings where coal gases and other acid fumes exist.

We manufacture **IRIDIUM ANTI-FRICTION METAL.** Will stand the **heaviest strain** that a bearing can be subjected to.

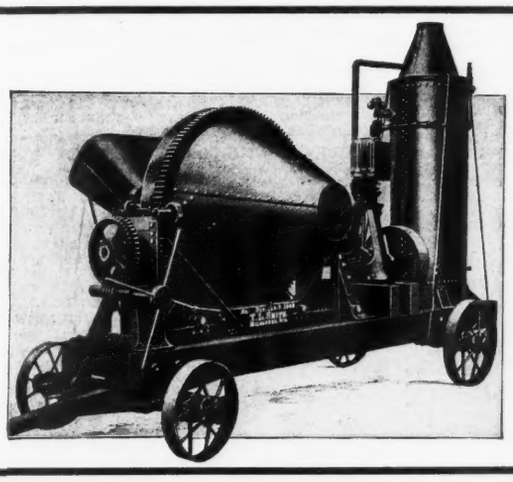
UNIVERSAL BEARING METAL will carry heavy weight under high pressure without crushing and always uniform. Endorsed by leading Railroads.

Send for our new Illustrated Booklet, mailed free upon application.

MERCHANT and CO., Inc.

SOLE MANUFACTURERS

Philadelphia
New York
Chicago
Brooklyn



THE
SMITH CONCRETE MIXER
THE ONLY MIXER

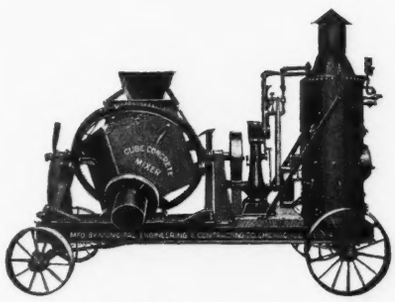
ARE YOU UP-TO-DATE? *BETTER GET IN LINE.*

SEND FOR CATALOG.

CONTRACTORS' SUPPLY AND EQUIPMENT CO.

NEW YORK:
170 Broadway

CHICAGO:
Old Colony Building



Send for Catalogue O.

When purchasing a **Concrete Mixer** get one that will **mix thoroughly, quickly, cheaply** and is **self cleansing.**

THE CHICAGO IMPROVED CUBE CONCRETE MIXER

is the only one to consider.

Seven sizes: Batches 2 to 64 cubic feet.
Any combination as to mounting and power.

MUNICIPAL ENGINEERING AND CONTRACTING CO.
Railway Exchange — Chicago, U. S. A.

THE FEDERAL RAILWAY SIGNAL CO.

Manufacturers of **SIGNALS, INTERLOCKING AND RAILWAY SAFETY APPLIANCES**

NEW YORK OFFICES: 150 NASSAU ST. WORKS: TROY, N. Y.

For Paulus, Buda and other Track Drills.

Standard Twist Drills

The result of years of fruitful experience, producing Drills of

Highest Quality that

STAND SEVERE SERVICE

Write for Catalog No. 7

The Standard Tool Company's TWIST DRILLS

ARE ESPECIALLY ADAPTED FOR Railroad Work

Office and Factory CLEVELAND, OHIO

Taper Square Shank, Fitting all Ratchets in General Use.

pleted. J. W. Beatty, Winfield, is the engineer in charge of the work. (Mar. 11, 1904.)

WINKLE, HOUSTON & ST. LOUIS.—Incorporated in Illinois to build from Winkle, Perry County, west to Houston, Randolph County, 20 miles. C. A. Lyle, H. C. Rutledge and A. J. Davis, of Winkle, Ill., are incorporators.

WISCONSIN & ILLINOIS.—Incorporated in Wisconsin to build from Warren, Ill., northwesterly across the Wisconsin State line to Hazel Green, Ipswich, Platteville, Lancaster and Bloomington, with a branch from Ipswich to East Dubuque, a total of 98 miles. M. S. Sickle and A. W Kopp, of Platteville, are incorporators.

*WISCONSIN & MICHIGAN.—Logging spurs under construction.

WISCONSIN CENTRAL.—This company is reported to have finished a survey for an extension of its Portage branch to Lake Ennis., Wis., where a large cement plant is to be built by the Wisconsin Portland Cement Co.

——Cut-off from Chippewa Falls, Wis., southeast to Marshfield, 65 miles. Authorized. Surveys have been finished for this line and grading will shortly be begun. (Mar. 11, 1904.)

——Three-mile spur from Camp Lake to Wilmot, Kenosha County, Wis. Projected. (Mar. 11, 1904.)

——*Extension from Park Falls, Price County, Wis., northeast to a point in Ashland County, 10 miles. Work in progress. (Mar. 11, 1904.)

WISCONSIN ROADS.—Line from Dunbar, Wis., terminus of the Dunbar & Wausaukee, west to a point where the Peshtigo River crosses Marinette and Forest counties. Surveys reported. (Mar. 11, 1904.)

——The Foster-Latimer Lumber Company will build a logging road 29 miles long from its mills at Mellen, Wis., into timber lands. H. J. Latimer is Chief Engineer, and Geo. E. Foster is President. (Mar. 11, 1904.)

——The Edwin Hines Lumber Co. will build a line in Douglas County, Wis., 16 miles long, connecting its logging road with the St. Croix & Duluth. (Mar. 11, 1904.)

WOODWORTH & LOUISIANA CENTRAL.—Extension from Nelsonville, La., to Sabine River, 85 miles. Projected. (Mar. 11, 1904.)

WYANDOTTE TERMINAL.—Incoporated in Michigan, with a capital stock of $100,000, to build a terminal railroad connecting the Detroit Southern and the property of the Michigan Alkali Works with the Michigan Central and the Detroit River near Wyandotte. M. R. Bacon, P. R. Will, J. J. Griffith and E. P. Smith, of Wyandotte, Mich., are incorporators.

WYOMING & BLACK HILLS.—Incorporated in Wyoming, to build from Upton, Wyo., on the Chicago, Burlington & Quincy, northeast to Belle Fourche, S. Dak., 75 miles. L. C. Twombley, Cheyenne, Wyo., and A. E. Johnson and C. T. Wallace, of Minneapolis, are incorporators. (Mar. 11, 1904.)

WYOMING & NORTH WESTERN (CHICAGO & NORTH WESTERN).—Incorporated to build west from Casper, Wyo., on the C. & N. W., across the Shoshone Indian Reservation to Lander, 150 miles.

WYOMING ROADS.—Application has been made to the Chamber of Commerce of Boise, Idaho, for right of way for a distance of 10 miles east and 20 miles west from the city and for 40 acres for a site for machine shops for a proposed road from Casper, Wyo., to run west through Teton Pass to Hailey, Blaine County, Idaho, west through the mountains to the South Boise Valley, crossing the Snake River near Nyssa, through the Malheur Valley to Vale, Ore., thence west to the coast at some point in west Oregon, 898 miles. F. L. Evans, of Boise, the Secretary of the Missouri Trust Co., St. Louis, is interested.

——Narrow gage road from New Castle, Wyo., north to the Cambria coal region, 20 miles. The Horseshoe Co. is interested. (Mar. 11, 1904.)

——The North American Copper Co. will build a railroad from Walcott, on the Union Pacific, south to Encampment, Wyo., 38 miles. (Mar. 11, 1904.)

——Surveys in progress by the Kemmerer Coal Co. for a line from Kemmerer, Wyo., north to its coal mines, 8 miles. (Mar. 11, 1904.)

——Projected line by the Pennsylvania Oil & Gas Company from Casper, Wyo., north to the Salt Creek oil fields, in Natrona County, 60 miles. (Mar. 11, 1904.)

Y

YAZOO & MISSISSIPPI VALLEY (ILLINOIS CENTRAL).—Reported that a connection is to be built from Helm, Miss., north to Arnold, in Bolivar County, 20 miles. Surveys reported completed, and grading to be begun at once. Would connect two branches of the Yazoo & Mississippi Valley.

——Surveys reported for a projected connecting line from Minter City, Miss., southwest via Ittabena, Belzona, Silver City and Midnight to Rolling Fork, 85 miles.

——*Contract let to J. E. Murray & Son, of Cedar Rapids, Iowa, for building a three-mile extension from Mattson, Miss., to Roundway. Grading to be begun at once.

——*Cut-off from Yarboro, Miss., south to Swan Lake, 20 miles. Practically completed. (Mar. 11, 1904.)

——*Cut-off 6½ miles long between Etters, Tenn., and Lakeview, Miss. Projected. (Mar. 11, 1904.)

YELLOWSTONE VALLEY RAPID TRANSIT.—Reported that this company is about to build an electric line through the entire length of the lower Yellowstone Valley from Glendive, Mont., to a point on the Missouri River opposite Buford, N. Dak., and connecting the Great Northern and Northern Pacific railroads.

*YOUNGSTOWN & SOUTHERN (Electric).—Contract for building this electric road from Youngstown, Ohio, to East Liverpool, with a branch line to Salem, a total distance of 61 miles, let to the J. R. White Co., of New York. A. W. Jones is President and George Todd, Jr., Chief Engineer, both of Youngstown, Ohio.

YREKA & SCOTT VALLEY.—Incorporated in California, with an authorized capital of $750,000, to build from Yreka, Cal., into the Scott Valley. C. H. Morrison is President and J. E. Harmon, Secretary.

YUKON-VALDEZ RAILROAD.—Incorporated in Virginia, with an authorized capital stock of $10,000,000, to build a railroad from a point on the bay of Valdez, in Alaska, to a point near Eagle City, about 350 miles. J. W. Wilcox, Norfolk, Va., is said to be interested.

Canada.

*ALGOMA CENTRAL & HUDSON BAY.—This company's main line, which is to run from Sault Ste. Marie via Searchmont to Michipicoten, 170.5 miles, is in operation from Sault Ste. Marie to Ogidaki, 48 miles. Track is laid 18 miles further and grading completed to Michipicoten. Twenty-five miles of branches are also in operation. Connors & Bowman, of Toronto, Ont., are the contractors. It is proposed to extend the road from Michipicoten north to the mouth of the Moose river, on Hudson Bay, 175 miles, with a branch from a point on the main line 15 miles northeast of Sault Ste. Marie, to a connection with the Sudbury branch, 100 miles.

ALGOMA COPPER RANGE.—Application will be made to the Dominion Parliament for incorporation of this company to build a road from Batchewauna Bay, on Lake Superior, in the Algoma district, to Superior Mines, 75 miles, and thence to a connection with the Canadian Pacific near Biscotasing, Ont.

ATHABASCA RAILWAY & OIL COMPANY.—Application will be made to the Dominion Parliament to incorporate this company with power to build from Edmonton, Alberta, northeasterly to the Athabasca River near the Clearwater River, 250 miles.

ATLANTIC, QUEBEC & WESTERN.—This company, organized in England, has obtained a Dominion charter, and a subsidy of $6,400 a mile from the Government, together with a grant of 4,000 acres per mile from the legislature of the Province of Quebec. The land is to be sold to settlers at a maximum rate of $2 an acre. The projected road will run from Gaspe, on the Gulf of St. Lawrence, west to Causapascal, on the Intercolonial Railway, about 150 miles. The road is to connect with a line of steamers to Great Britain, avoiding the dangers of the St. Lawrence River and gaining 24 hours in time over the present water route from Montreal. The same company is planning to build the remaining portion of the line along the Gaspe coast to connect with the Atlantic & Lake Superior, now operating from New Carlisle west to Metapedia, 98 miles, in the county of Bonaventure. This will be a very expensive road to build, as it will cross five or six rivers at their mouths, where costly bridges will have to be built. The charter provides for the building of both sections at the same time under penalty of forfeiture of the charter. Surveys have been made but no further work has been done. Extension of time of one year for beginning work has recently been asked.

BERLIN, WATERLOO, WELLESLEY & GEORGIAN BAY.—New line from Berlin to Waterloo, Ont., thence via Wellesley and Markdale to Collingwood, 80 miles. Incorporated. J. G. Reiner, Berlin, Ont., is interested. (Mar. 11, 1904.)

BOUNDARY, KAMLOOPS & CARIBOO CENTRAL.—Application made to the Dominion Parliament for the incorporation of this company, which proposes to build from Midway, B. C., northwest to Okanagan Lake and thence north via Kamloops to a terminus in Yukon Territory.

BRANDON, SASKATCHEWAN & HUDSON BAY. Proposed line from international boundary of Manitoba between ranges 23 and 25 west, in northerly direction to Brandon, thence to Pas Mission on the Saskatchewan River, and to Fort Churchill on Hudson Bay, with branches northwest to the Souris River, and from Brandon northwest to Neeppawa. Application made to Dominion Parliament. Clement & Clement, Brandon, Man., are interested. (Mar. 11, 1904.)

BRANTFORD & ERIE.—Application made to build from Brantford, Ont., south to Simcoe, 25 miles. P. A. Dickson, Delhi, Ont., is interested. (Mar. 11, 1904.)

BROCKVILLE, WESTPORT & NORTHWESTERN.—Extension proposed from Westport to North Bay, 250 miles. John Gerken, World Building, New York, is President. (Mar. 11, 1904.)

BRUCE MINES & ALGOMA.—Extensions to a point on the Canadian Pacific between Chapleau and Biscotasing and from Rock Lake Mill, Ont., the present terminus, to a point on James Bay. Both authorized. John McKay, Sault Ste. Marie, is interested. (Mar. 11, 1904.)

CALGARY, RED DEER AND BATTLEFORD.—Incorporation asked by this company from the Dominion Parliament with power to build from Calgary to Battleford, Saskatchewan, 300 miles. McGiverin and Haydon, Ottawa, Ont., are the solicitors.

CAMPBELLFORD, LAKE ONTARIO & WESTERN.—New line authorized by the Dominion Government from Blairton, Ont., on the Canadian Pacific, via Campbellford and Whitby to Leaside Junction, Ont., on the Canadian Pacific near Quebec. W. J. Crossen, Cobourg, Ont., said to be interested.

CANADA-MIDDLESEX.—Application will be made to the Dominion Parliament for a charter to build from the Niagara River to London, Ont. Chryster & Bethune, Ottawa, Ont., are the solicitors.

*CANADIAN NORTHERN.—Contract let to J. D. McArthur, of Winnipeg, for building the line to Edmonton, Alberta. Work in progress. The contract includes grading, bridging and track laying. The line is now in operation from Winnipeg, Man., northwest to Kamsack, Alberta, 279 miles. The extension from Kamsack to Edmonton will be about 550 miles long.

*——Work under way on the extension of the Prince Albert section from Melfort, Saskatchewan, west to Prince Albert, 60 miles. Will include a bridge over the Saskatchewan River about 15 miles southeast of Prince Albert.

——The legislature of Manitoba has voted to guarantee $1,890,000 of Canadian Northern bonds, being $10,000 a mile for 189 miles of road. This guarantee is to provide for the construction of five branches as follows: From Carberry, Manitoba, west to Brandon, and thence to the western boundary of Manitoba, 100 miles; from Winnipeg east across the Red River, 25 miles; a branch to Bird's Hill, seven miles; a branch from a point between Winnipeg and Oak Point across the Assiniboine River to connect with the St. Charles and Winnipeg line, seven miles, and a branch from Emerson to connect with the main line between Woodbridge and Sprague, 15 miles. One million dollars of bonds additional was guaranteed for the purpose of acquiring terminals in Winnipeg.

——This company has given notice of application for charters to construct the following lines: From Regina northwesterly to a point on the Red Deer River in Alberta, with a branch line west of the Saskatchewan River and running north to a point in or near Carlton, on the North Saskatoon River. From Regina north

THE WOLHAUPTER RAIL JOINT

IN USE ON OVER 24 RAILROADS

AWARDED A "SILVER MEDAL" AT ST. LOUIS

After a thorough trial in track, some of the best railroads in the country have placed this joint on the same basis as other base supported joints.

(Central Sec.)

Manufactured by

Illinois Steel Co.
Joliet, Ill.

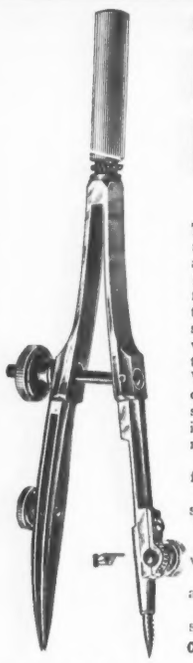
Lackawanna Steel Co.
Buffalo, N. Y.

SALES BY YEARS:

1st: ■

2nd: ■■

3rd: ■■■



THE
UNIVERSAL
Dotting Pen
(Patented)

The UNIVERSAL DOTTING PEN is unrivalled in operation and beauty of workmanship. Every part is made of the finest German Silver except the pen, which is of tempered steel. No interchange of wheels is necessary to obtain different dotted lines. When another setting is required, merely give thumb screw one revolution and the instrument is ready for the new dot.

A few of the principal features are:

1st. It is supplied with ink same as any ruling pen.
2nd. It never blots.
3rd. Impossible for dotting wheels to be lost.
4th. Dots may be made any desired thickness.
5th. Will draw either straight or curved lines.

Can be Attached to Any Compasses.

Rack or Spiral Movement *Send for Circular*

Time, 45 seconds.

E. G. RUEHLE & CO.
Manufacturers and Importers of MATHEMATICAL INSTRUMENTS
DRAWING MATERIALS
Architects' and Engineers' Supplies
108 FULTON STREET, NEW YORK

Rails—Locomotives—Coaches

4 20x24 Consolidation Engines 2 20x24 8-Driver Switchers
3 19x24 Moguls 12 18x24 10-Wheel and Moguls
3 19x24 10-Wheelers

VARIOUS LIGHTER ENGINES—70 LOCOMOTIVES IN STOCK

350 FLAT, BOX AND STOCK CARS WITH AIR BRAKES
at attractive prices

Rails and Passenger Coaches

Southern Iron and Equipment Co. Atlanta, Ga.

CATECHISM
OF THE
LOCOMOTIVE

Price, $3.50

Railroad Gazette 83 Fulton Street NEW YORK

to Humboldt, thence northeasterly down the valley of Carrot Pass Mission on the Saskatchewan. From a point on the main line between Humboldt and the South Saskatchewan River, northeasterly to a point at the crossing of the South Saskatchewan River by the Prince Albert branch.

——*Extension from Clan William, Man., via Shoal Lake, to Rossburn, 65 miles. Some work done. A. McMillan, Westbourne, Man., contractor.

——*Arizona Branch from Portage la Prairie, Manitoba, to Carberry, 51 miles. Track laid for 25 miles and grading completed a year ago. Work to be finished soon.

——Plans reported filed under the name of the Edmonton & Slave Lake for the building of a line north from Edmonton, Alberta, for a distance of 50 miles, passing through St. Albert.

——*Plans filed of the proposed line from Hartney, Man., northwest to Regina, Assiniboia; almost an air line of 198 miles. Contract for grading 29 miles reported let to A. Kennedy, of Swan River, Manitoba.

*CANADIAN PACIFIC.—An officer writes that the line from Toronto north to Sudbury, Ont., will begin at a connection with the Owen branch at Woodbridge and run through Barrie, Balla, Parry Sound and Romford. The entire line will cost about $8,000,000, $2,000,000 of which will be required for the 58 miles from Byng Inlet north to Romford, on which the work is extremely rough and there will be much rock cutting. Work on this section is now in progress by the contractors, Foley Bros., Larson & Co., of St. Paul. A bridge will be built over the French River to cost about $300,000. The maximum grade for the entire line will be 0.3 per cent. and the maximum curvature 6 degrees.

——*Pheasant Hills branch from Kirkella, near the western boundary of Manitoba, northwest into Assiniboia, through Abernathy, Lipton, Hayward and Straussburg; 149 miles of track laid to a point two miles west of Lipton, Assiniboia. On the extension from Lipton, work under way and 60 miles partly graded. Foley Bros., Larson & Co., St. Paul, Minn., contractors.

——*Branch from Wetaskiwin, Alberta, on the Calgary & Edmonton branch, 114 miles north of Calgary, east to Battleford, Saskatchewan, 250 miles; 25 miles graded. Surveys made and maps filed for whole line. Foley Bros., Larson & Co., St. Paul, Minn., contractors.

——*Branch from Lacomb, Alberta, on the Calgary & Edmonton branch, 152 miles north of Calgary, east 100 miles; 28 miles graded and surveys being made for the remainder. Foley Bros., Larson & Co., St. Paul, Minn., contractors.

——New line from Golden, B. C., on the main line, southeast along the Columbia and Kootenay rivers, to Jaffray, on the Crow's Nest Pass branch, 180 miles. Projected.

——*Connecting branch from Brookdale, Manitoba, west to Varcoe, 18 miles. Graded.

——*Contract let to J. G. Hargrave & Co. to build a new line on the Yorkton branch out of Harrowby, Man. The change is made to get a better grade and to avoid several curves.

——*Contract let to Decks & Decks for building a subway under Main street, Winnipeg, Manitoba, to cost about $115,000. The work will include five concrete arches and eight tracks.

——Second track between Winnipeg and Fort William, 419 miles. Surveys now being made. This work will include a cut-off from Winnipeg east to Molson, Man., about 35 miles long.

——Reported that the Esquimalt & Nanaimo, which runs from Victoria, B. C., to Nanaimo, 76 miles, will be extended from Nanaimo to Quatsino Sound, at the head of Vancouver Island.

——Application made for permission to extend the Calgary & Edmonton branch from Edmonton northeast to Fort Saskatchewan, 20 miles. (Mar. 11, 1904.)

——Authority given to build from a point near Shebo, Assiniboia, the present terminus of the Northwest branch, 321 miles from Winnipeg, northwest, through Saskatoon, Saskatchewan, to Battleford, 225 miles. (March 11, 1904.)

——Reported that work will soon be begun on the new terminals of the company at Winnipeg, Manitoba.

——Application made to the Dominion Government for authority to build a line from Weyburn, Assiniboia, in a northerly direction to Hayward, 100 miles, connecting the Souris and Pipestone branches.

——See Georgian Bay & Seaboard, below.

——See Guelph & Goderich, below.

CANADIAN RAILWAY FINANCE COMPANY.—This company has acquired a royal charter in London, England, with a temporary capital of $16,000, to build a railroad from Hudson Bay to the Pacific Ocean.

CANADIAN YUKON WESTERN.—Incorporated to build from Dawson City west to the Alaskan boundary. J. H. Lamont, Prince Albert, Saskatchewan, is one of the incorporators. (Mar. 11, 1904.)

CAPE BRETON.—Extension from St. Peters to Louisburg and Sydney, 62 miles. Proposed. Subsidy of $3,200 per mile granted by the Dominion Government. G. E. Johnson, St. Peters, N. S., is General Manager.

CENTRAL ONTARIO.—Surveys completed for an extension of this road from its present terminus at Bancroft, Ont., northwest to Whitney, on the Canada Atlantic, 40 miles. Subsidy of $128,000 granted by the Dominion Government; also of $3,000 per mile by the government of Ontario. Grading will probably be begun early this spring. J. D. Evans, Trenton, Ont., is Chief Engineer.

CHATHAM, WALLACEBURG & LAKE ERIE.—Charter granted to build from Rondeau, Ont., to Wallaceburg, via Chatham, with branches to Petrolia and to Blenheim. William E. McKeough, Chatham; H. L. Dunn, Toronto and D. A. Gordon, Wallaceburg, are incorporators. (Mar. 11, 1904.)

CHICAGO, SOO & NORTH ATLANTIC RY. & STEAMSHIP CO.—Application made to the Dominion Parliament for authority to build a railroad from Sault Ste. Marie to a point on James Bay, Ont., and thence in a northeasterly direction through Quebec province to Hamilton Inlet on the coast of Labrador; also to operate steamers on the waterways reached by the railroad. W. R. Grundy, Toronto, Ont., may be addressed.

*COAST KOOTENAY.—Proposed line from Vancouver through New Westminster, and the Chilliwack Valley to Hope, and thence southeast to Princeton. Work in progress by McLean Bros., Vancouver, B. C. Wm. E. Oliver, Victoria, B. C., is interested. (Mar. 11, 1904.)

CRAWFORD BAY & ST. MARY'S.—Proposed line from Crawford Bay, B. C., to Fort Steele. Macdonald & Winn, Rossland, B. C., are the solicitors. (Mar. 11, 1904.)

ESSEX TERMINAL.—Proposed road from Walkerville, Ont., south to Amhurstburg, 15 miles. F. A. Hough, of Amherstburg, is interested.

FORT FRANCES, MANITOU & ALBANY RIVER.—Incorporated to build from Fort Frances, Ont., to Dinorwic, 90 miles, with a branch from Manitou Lake to Dryden. (Mar. 11, 1904.)

GEORGIAN BAY & SEABOARD (CANADIAN PACIFIC.—Authority asked from the Dominion Government by the Canadian Pacific to incorporate this road, with a capital stock of $500,000, to build from a point on Georgian Bay between Port Severn and Penetanguishene, southeasterly through Simcoe, Ontario, Victoria, Peterborough, Hastings, Lennox, Addington, Frontenac and Lanark counties to a connection with the Canadian Pacific, about 225 miles. W. D. Matthews, H. C. Hammond and Henry Beatty, of Toronto, are incorporators.

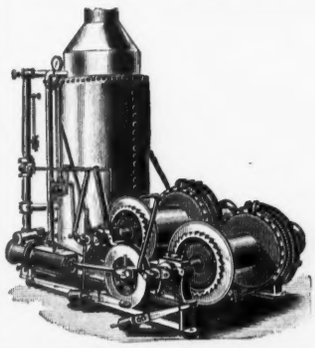
*GRAND TRUNK.—Contract for double tracking the last section of single track between Montreal and Chicago reported let to Ross & McRae, of Montreal, to be finished August 1. This covers the building of a second track from London, Ont., east to Kingscourt Junction, 37.42 miles.

——Reported that, as soon as the Canada Atlantic has been finally transferred to the Grand Trunk, a branch will be built from Ottawa to Kingston, 100 miles. This would give the Grand Trunk a more direct line between Ottawa and Toronto than the present line via Coteau Junction.

——See Grand Rapids Terminal under United States.

*GRAND TRUNK PACIFIC.—New trans-continental line in Canada, from Moncton, N. B., to a point on the Pacific Ocean at or near Port Simpson, B. C., 3,500 miles. Surveying parties now

The Contractors' Plant Manufacturing Co.



129 ERIE STREET, BUFFALO, N. Y.

Derricks, Steel, Wood or Pipe, Jib Cranes, Derrick Irons, and Contractors' Supplies.

Electric, Steam, Horse and Hand Power.

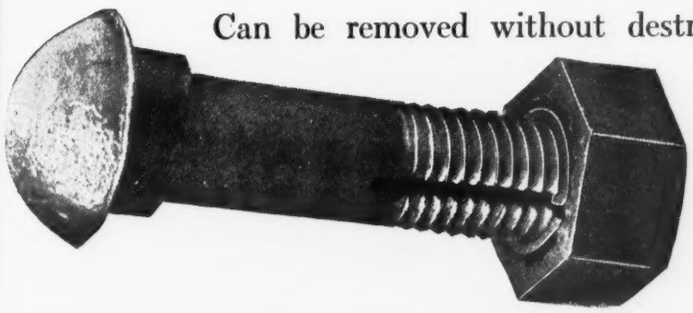
HOISTING MACHINERY

HAVE LARGE STOCK ON HAND.

It can't work loose or wear

SO EASY TO PUT ON

Can be removed without destroying either Bolt or Nut



MADE IN ALL SIZES OF TRACK AND MACHINE AND SPECIAL BOLTS BY THE

Border Bolt and Nut Lock Company

RICHMOND, IND. U. S. A.

in the field. The 1,800 miles from Moncton to Winnipeg, called the Eastern Division, will pass through the City of Quebec, and will be built at the cost of the Government of Canada. The 1,700 miles from Winnipeg to the Pacific Ocean, called the Western Division, will be built at the cost of and owned by the company. The company is also authorized to build branches, of which the most important is the Lake Superior branch, which will run from a junction with the Eastern Division to a point on Thunder Bay, on Lake Superior, about 220 miles, and is, in reality, a division of the main line, as it is to form a chief link in the route for the products of the northwest to the point of shipment in lake steamers to the Grand Trunk System in the east via Lake Huron and Georgian Bay. Estimated cost of the construction of this branch is within $30,000 per mile, and it is planned to have it completed within three years from the beginning of construction. The Western Division will be divided into two sections, the Prairie section, from Winnipeg to the Rocky Mountains, and the Mountain section, from the Rocky Mountains to the coast. The grades eastward on the Prairie section will be limited to a maximum of 21 ft. per mile. Estimates show that the cost of construction will be within $20,000 per mile, and that the line can be in operation within five years from the beginning of construction. Contracts for work on the Western Division, involving an outlay of $15,000,000, reported let to Foley Bros., Larson & Co., of St. Paul, Minn.

*GREAT NORTHERN OF CANADA.—Permission will be asked from the Dominion Parliament to build a line from Grand Mere east to Quebec, 100 miles, and for a branch line to the Quebec bridge.

GREAT NORTHWEST TRANSIT.—This company is a consolidation of the Hudson Bay & Northwest and the Manitoba & Keewatin, and proposes to build a line from Winnipeg, Man., northeast to the eastern boundary of the province and thence east through the district of Keewatin to tidewater at the mouth of the River Severn, with branches to Lake Winnipeg and to the main line of the Canadian Pacific. Howell, Mathers & Howell, Winnipeg, are interested.

*GUELPH & GODERICH (CANADIAN PACIFIC). New line from Guelph, Ont., west to Goderich, on Lake Huron, 80 miles. Contracts let to A. M. Piggott, of Hamilton, Ont., and D. B. Campbell, of Strathroy. Grading reported finished and track laying to be begun this spring. P. A. Peterson is Chief Engineer and J. W. Leonard, President.

*HALIFAX & SOUTHWESTERN.—New line from Halifax, N. S., southwest through Mahone Bay, Bridgewater and Liverpool to Barrington Passage, 196 miles. In operation from Halifax to Liverpool, 112 miles. From Liverpool to Barrington Passage, 84 miles, under construction. Atlantic Contracting Co., contractors. Maximum grade, 1.5 per cent.; maximum curvature, 7 degrees. T. H. White, Bridgewater, N. S., Chief Engineer. Mackenzie, Mann & Co., Ltd., Toronto, Ont., are interested.

——See Middleton & Victoria Beach.

HAMILTON, BERLIN & COLLINGWOOD.—Chartered to build from Hamilton, Ont., north via Galt and Berlin to Collingwood, 90 miles. Clarke, Gowan, Bartlett & Bartlett, Windsor, Ont., are interested. (Mar. 11, 1904.)

HERRING COVE.—Application made to the New Brunswick Legislature to grant incorporation to a company to build a railroad from Alma, N. B., to Herring Cove. C. J. Osman, Alma, is the solicitor.

HURON, ERIE & BUFFALO.—Incorporated to build east from St. Thomas, Ont., to the Niagara River, 100 miles, and west to Sarnia, Ont., 60 miles. The Pere Marquette is said to be interested. (Mar. 11, 1904.)

*INTERCOLONIAL.—Extension from Campbellton, N. B., southwest to St. Leonards, on the St. John River, 100 miles. 20 miles of track laid from Campbellton in 1899. Reported that work will be resumed in May and the road completed to St. Leonards by the end of the year. Contract for grading reported let to T. Malcolm.

——See Quebec Bridge & Railway Co.

INTERNATIONAL & SOUTHERN.—Incorporation asked from the Dominion Government to build from Savanne, Ont., on the Canadian Pacific, via Kashabowie, to a point near Hunters' Island, on the international boundary line between Ontario and Minnesota, 90 miles. D. Mills, Port Arthur, Ont., is the solicitor. Surveys for this line were made in 1903 in the interest of Mackenzie, Mann & Co.

*JAMES BAY.—Surveys completed for this projected line from Toronto, Ont., to Sudbury, 260 miles. MacKenzie & Mann have the charter, and subsidies have already been granted by the Dominion and Ontario Parliaments. Contract let to Angus Sinclair, A. A. Mann and A. McKenzie, for building this road from Toronto to Parry Sound, 140 miles. The contract calls for the completion of the line by September, 1905.

——Application will be made to the Dominion Parliament for power to build a line from the mouth of French River, on Georgian Bay, through Ottawa to Montreal, and for a line from a point north of Toronto via Ottawa to Montreal.

JOLIETTE & LAKE MANUAN.—Application made to the Dominion Government for authority to build from Joliette, Que., south to Montreal, 40 miles, with several branches.

KENT NORTHERN & EXTENSION.—Incorporated to build from Kent Junction, New Brunswick, on the Intercolonial, through the counties of Kent and Queens, to a point near Chipman, N. B. T. Ritchie, of Halifax, N. S., is interested. (Mar. 11, 1904.)

KETTLE VALLEY.—Surveys in progress for the proposed North Fork branch of this road from Grand Forks, B. C., to Franklin Camp, 50 miles up the Kettle River. A subsidy of $3,200 per mile was recently voted the company by the Dominion Government.

KINGSTON & DOMINION CENTRAL.—Application will be made to the Dominion Parliament for authority to build an extension from a point on this road between Brockville and Westport, Ont., to the city of Montreal, and an extension from a point near Westport to the city of Ottawa, and to change the name of the company to the Montreal, Ottawa, Kingston & Georgian Bay.

KINGSTON & FRONTENAC.—Application made for power to build a steam or electric line from Kingston to Loughborough Lake, and from Loughborough Lake to a point on the Kingston & Pembroke. Nothing done. McGiverin & Haydon, Ottawa, are interested.

KINGSTON & PEMBROKE.—Branch from Sharbot Lake, Ont., northeast 36 miles, via Zealand, Playfair and Lanark, to Carleton Place. Application made to Dominion Parliament for extension of time in which to build. (Mar. 11, 1904.)

KLONDIKE MINES.—This company, which proposes to build a road from Dawson City, Yukon, via Grand Forks, to the Stewart River, 84 miles, has completed 13 miles of its line from Dawson City to Grand Forks. The contractor for this was the Dawson, Grand Forks & Stewart River Railway Corporation, Ltd., of 2 Suffolk Lane, London, England. H. B. McGiverin, of Ottawa, is interested.

KOOTENAY, CARIBOU & PACIFIC.—New line from Golden, B. C., northwest to Fort George, on the Fraser River. Incorporated. Harvey & McCarter, solicitors, Fort Steele, B. C., may be addressed. (Mar. 11, 1904.)

LAKE ERIE & DETROIT RIVER (PERE MARQUETTE).—Application made to the Dominion Parliament for authority to build from Walkerville, Ont., to a point on the Detroit River, near Sandwich.

LAKE SUPERIOR, LONG LAKE & ALBANY RIVER.—Surveys completed for 30 miles of this proposed railroad, from Peninsula Harbor, Ont., towards Albany River. H. DeQ. Sewell, Toronto, is Chief Engineer.

*LINDSAY, BOBCAYGEON & PONTYPOOL.—New line from Pontypool, Ontario, north to Lindsay, and thence northeast to Bobcaygeon, 40 miles. Contract let. H. W. Armstrong, Lindsay, Ont., may be addressed. (Mar. 11, 1904.)

LONDON & ST. CLAIR.—Application made to the Dominion Government for authority to build from a point on the line of the Canadian Pacific, west of the city of London, to a point on the St. Clair River at Sarnia, or between Sarnia and Lake St. Clair.

LOUGHBOROUGH.—Incorporation asked to build from a point on the Kingston & Pembroke east to Loughborough Lake, Ont. Nothing done. McGiverin & Haydon, Ottawa, are interested.

*MABOU & GULF.—New railroad from a point on the Inverness Coal Company's line to a point on the Intercolonial at Orangedale, Nova Scotia, 54

miles. Grading completed for a distance of 5 miles. F. R. Page, Maybou, Cape Breton, N. S., is Chief Engineer. (Mar. 11, 1904.)

MELITA, REGINA & EDMONTON.—Application made to the Dominion Government to incorporate this company to build a railroad from Melita, Manitoba, northwest to Regina and thence in a northerly direction to a point near the South Saskatchewan River and eventually to Edmonton. Names of the promoters are not stated.

*MIDDLETON & VICTORIA BEACH.—Extension of the Halifax & Southwestern from Middleton, N. S., near Barrington Passage, north to Victoria Beach, 40 miles. Grading completed. T. H. White, Bridgewater, N. S., is Chief Engineer. MacKenzie, Mann & Co., Ltd., Toronto, Ont., are interested.

MIDWAY & VERNON.—Extension of time now being asked for beginning work on this railroad. The company was granted a subsidy of $3,200 per mile at the recent session of the Dominion Parliament, with power to build a line from Midway, B. C., to Vernon, about 125 miles. (Mar. 11, 1904.)

MONTREAL, OTTAWA, KINGSTON & GEORGIAN BAY.—See Kingston & Dominion Central above.

MONTREAL, QUEBEC & SOUTHERN.—Application made to the Dominion Parliament to incorporate this company to build from St. Guillaume to the city of Sorel, in the county of Richelieu, and with power to acquire the South Shore Railway Co., the Montreal Longueuil Bridge Co., the Quebec Southern and the East Richelieu Valley Railway.

MOOSE JAW & EDMONTON.—This company will apply to the Dominion Government for authority to build from Moose Jaw, Assiniboia, northwest to Edmonton, Alberta, 425 miles. Both places are on the Canadian Pacific, but the line between them is roundabout.

*NEPIGON.—Application made to the Dominion Parliament for power to build an additional line from the Albany River to Fort Churchill. The original line was projected from Nepigon Bay, on Lake Superior, to Nepigon Lake, 40 miles. Conmee & Bowman, Port Arthur, Ont., have the general contract for building.

NEW BRUNSWICK RAILROAD.—Application made to the New Brunswick Legislature to incorporate this company, to build from Hampton, N. B., southwest to St. John and thence north to Gagetown, 50 miles. J. S. Armstrong, St. John, N. B., may be addressed.

NEW BRUNSWICK ROADS.—The Canadian Coal Line Co. will build from Coal Branch, N. B., to Richibucto Harbor, 16 miles. J. P. Geddes, Coal Branch, N. B., is interested. (Mar. 11, 1904.)

NEW BRUNSWICK SOUTHERN.—Reported that surveys will be made from St. John, N. B., to New River Beach, on the Bay of Fundy, and that an extension will be built to Calais, Me. H. H. McLean, St. John, N. B., is President and Manager.

NIAGARA, QUEENSTON & ST. CATHARINES (Electric).—Chartered to build an electric railroad from St. Catharines to Queenston. G. J. McIntyre, Niagara, Ont., is interested. (Mar. 11, 1904.)

NIPISSING, OTTAWA & MONTREAL.—Application made to the Dominion Parliament for incorporation of this company to build from a point on Lake Nipissing east to Montreal, with a branch line along the south side of the lake in a westerly direction to a point on Georgian Bay. Pearson & Denton, Toronto, are the solicitors.

*ORFORD MOUNTAIN.—Extension from Eastman, Que., to Potton Springs, 12 miles. Completed. Work now in progress on an extension from Kingsbury to Windsor Mills, 10 miles. Two miles of track laid and balance to be completed by September.

——Extension from Potton Springs to North Troy, 10 miles. Location surveys. H. C. Cleveland, Kingsbury, Que., is Chief Engineer.

OTTAWA & JAMES BAY.—New line from Ottawa through Buckingham to James Bay, with a branch to the Ottawa River, near Thurso, Que. MacCracken, Henderson & McDougal, Ottawa, are the Solicitors. (Mar. 11, 1904.)

OTTAWA, BROCKVILLE & ST. LAWRENCE.—Proposed line from Ottawa, through Richmond, Merrickville & Rideau Counties to Brockville, Ont., 55 miles. Would afford direct connection with the Grand Trunk, and by means of a ferry connect with the New York Central & Hudson River at Morristown on the St. Lawrence. Nothing done.

*OTTAWA RIVER.—Chartered to build from Montreal to a point on Georgian Bay between Midland and Parry Sound. Contract let to M. P. McGrath, of Easton, Pa., for building the line between Montreal and Ottawa, 100 miles.

OTTAWA RIVER & NORTHERN.—Application made to the Dominion Government for authority to build from Grenville in Argenteuil County, Que., to Montebello and thence along the Rouge and North Nation rivers to a connection with the projected Grand Trunk Pacific near the Lievre River.

PACIFIC NORTHERN & OMENICA.—New railroad from Kitamaat on the Pacific Ocean north to the Skeena River. It is stated that a contract for building this line will be let as soon as the plans have been approved. B. G. Goward, Victoria, B. C., is interested. (Mar. 11, 1904.)

PONTIAC & INTERPROVINCIAL.—Articles of incorporation amended so as to reduce capital from $1,000,000 to $600,000. The line is projected from Waltham, Que., to Ferguson's Point, and thence crossing the Ottawa River to Pettewawa and across the Chalk River to a point on Allumette Island opposite Pembroke; also a branch line to Chapeau.

*PRINCE EDWARD ISLAND.—Contract for building the branch line from Village Green to the Vernon River bridge, 4½ miles, let to Schurman, Morrison & Mitch, of Charlottetown, P. E. I.

*——Contract for branch line from Cardigan to Montague bridge, 6.3 miles, let to Willard Kitchen, of Fredericton, N. B.

——Extension of Murray River branch from Murray River to Machins Point, on Prince Edward Island. Subsidy asked. H. J. Mackenzie, Moncton, N. B., is Chief Engineer. (Mar. 11, 1904.)

*QUEBEC & LAKE HURON.—New line from Quebec via Grand Mere, Mattawa, and Lake Nipissing to French River, 450 miles. Work in progress between Quebec and Grand Mere, 80 miles. J. C. Cameron, Quebec, contractor, and H. G. Carroll, Quebec, may be addressed. (Mar. 11, 1904.)

*QUEBEC & LAKE ST. JOHN.—Contract let to Joseph Paquet, of Levis, Que., for building the La Tuque branch from La Tuque Junction, 82 miles from Quebec, to La Tuque Falls, on the St. Maurice River, 40 miles. One mile of track is laid.

——*Contract let to E. Conway for building a branch from St. Gabriel to Gosford, 5 miles.

——Branch from Jonquieres to La Baie, 20 miles. Subsidy granted. Not yet begun.

*QUEBEC BRIDGE & RAILWAY CO. (INTERCOLONIAL).—This company's line from a point on the Intercolonial to the St. Lawrence River, across the St. Lawrence River and into Quebec, 10 miles, is all under contract to M. P. Dovis, of Ottawa, Que. Grading is completed for two miles and one mile of track is laid. The contract includes the building of a double-track bridge 800 ft. long over the Chaudiere River on the Levis side of the St. Lawrence River.

*QUEBEC, NEW BRUNSWICK & NOVA SCOTIA.—Messrs. Mackenzie & Mann have filed with the Department of Railways and Canals the plans of the route of this proposed railroad which has been chartered by Parliament. The line will leave a point on the Great Northern of Canada and connect with the Quebec bridge, thence southwesterly via the valley of the Etchemin River to the Maine State line. After crossing this State, and entering the province of New Brunswick, the route will be via Woodstock to Fredericton and Moncton, thence through the northern portions of the counties of Westmoreland and Cumberland to Pugwash Junction. From the latter point the Intercolonial will be used to New Glasgow, and from New Glasgow a new line built to Country Harbor. Work on this last line reported under way.

REGINA & HUDSON BAY.—New line from a point on the International boundary between the second and third meridians, to Regina, and thence through Craven in a northerly direction to Carrot River and Fort Churchill. Incorporated. McGiverin & Hayden, of Ottawa, Ont., are the solicitors. (Mar. 11, 1904.)

ST. CHRYSOSTOM.—New road from St. Chrysostom, Quebec, to connect the Grand Trunk with the township of Hinchinbrook in the district of Beauharnois. (Mar. 11, 1904.)

ST. MARY'S & WESTERN ONTARIO.—Charter being asked from the Dominion Parliament with power to build from the Canadian Pacific between Woodstock and London, Ont., to a point near Grand Bend or Sarnia, Ont. Reported to be in interest of the Canadian Pacific. J. W. Graham, St. Mary's, Ont., may be addressed.

ST. MAURICE VALLEY.—Application made to the Dominion Parliament for incorporation of this company to build from Three Rivers, Que., to St. Jean des Piles, in the county of Champlain, and thence northwest to Mattawin River, where connection can be made with the Grand Trunk Pacific. Tourigny & Bureau, of Three Rivers, are the Solicitors.

SARNIA, PETROLIA JUNCTION & ST. THOMAS.—Incorporated to build from Sarnia, Ont., east via Petrolia Junction, to St. Thomas, 60 miles. Surveys. J. D. Stewart, Sarnia, Ont., is interested. (Mar. 11, 1904.)

SOUTHERN CENTRAL.—Incorporated in Canada with power to build from Vancouver east via Kootenay Pass, Crow's Nest Pass, Old Man River and Saskatchewan to a point on Hudson Bay, 100 miles north of Fort Churchill. E. F. B. Johnson, Toronto, and James Whalen, Port Arthur, are interested. (Mar. 11, 1904.)

STRATHROY & WESTERN.—Application will be made at the next session of Parliament to incorporate a company to build from St. Thomas to a point on Lake Erie, with several branches. The company already has the right to build a line from St. Thomas north to Park Hill. Royce & Henderson, Toronto, Ont., are interested. (Mar. 11, 1904.)

*TEMISKAMING & NORTHERN ONTARIO.—New government road from North Bay, Ont., north and east via Temagami, Cobalt and Haileyburg to New Liskeard, 113 miles. Completed for this distance. Extension from New Liskeard north to Grand Trunk Pacific Junction, 125 miles, under contract to A. R. MacDonell, North Bay. Located for 65 miles, grading completed for 30 miles and track laid for 25 miles. W. B. Russell is Chief Engineer.

THUNDER BAY, NEPIGON & ST. JOE.—Bonus of $160,000 granted for building this proposed road from Port Arthur, Ont., in a northeasterly direction, 50 miles. (Mar. 11, 1904.)

TORONTO, HAMILTON & BUFFALO.—$1,000,000 of debenture stock voted, the proceeds to be used in improving the road.

VANCOUVER ROADS.—New railroad from Spences Bridge southeast through Nicola, Aspens Grove, Otter Flat, Granite Creek and Princeton to a point on the International boundary near Midway. Application for charter filed. Sinclair & Company, Vancouver, B. C., are interested. (Mar. 11, 1904.)

*VANCOUVER, VICTORIA & EASTERN (GREAT NORTHERN).—Extension from Grand Forks, B. C., northwest to Phoenix, 24 miles, with branch to Granby Smelter, 6½ miles. Grading completed. Contract let to Porter Bros., of Phoenix, B. C., for track laying and bridges. J. H. Kennedy, Grand Forks, B. C., is Chief Engineer.

——Extension from Midway, B. C., southwest to Oroville, Wash., 35 miles. Surveyed.

VANCOUVER, WESTMINSTER & YUKON (GREAT NORTHERN).—Line from North Vancouver, B. C., through Le Clovet to connections with the projected lines of the Grand Trunk Pacific and the Canadian Northern in the northern part of British Columbia. Proposed.

WALKERTON & LUCKNOW.—Application made to the Dominion Parliament for authority to build from Hanover, Ont., through Durham to a point between Martindale and Dundalk; also from Lucknow to Wingham and from Teeswater to Kincardine. Reported to be in the interest of the Canadian Pacific.

WHITE HORSE & ALSEK.—Application made to the Dominion Government for a charter to build from White Horse, Yukon, west to Lake Kluane and thence by White Horse Valley to Dawson City. This line would pass through the gold fields of Alsek and Kaskowlish.

WHITE HORSE & ALASKA.—Application made for the incorporation of a company to build from Whitehorse, Yukon, to Dawson City. Livingstone, Garrett & King, Vancouver, B. C., are interested. (Mar. 11, 1904.)

WOLFE, MEGANTIC & LOTBINIERE.—Proposed line in Quebec from Lime Ridge, in the county of Wolfe, to Quebec, through the counties of Wolfe, Megantic, Lotbiniere and Levis, along the valley of the Thames River. Extension of the charter and subsidies desired. No construction work. W. H. Lamby, Inverness, Que., is Secretary.

WOODSTOCK & LAKE HURON.—Application made to the Dominion Parliament to authorize the construction of a railroad from Woodstock, Ont., northwest to a point on Lake Huron near Kincardine, 90 miles.

YUKON PACIFIC.—New line from a point on or near the Chilkat River, on the International boundary between Alaska and British Columbia, to a point at or near Rainy Hollow, B. C., and thence northeast to the Yukon, near White Horse. F. H. Chrysler, Ottawa, solicitor. Incorporated in May, 1902. (Mar. 11, 1904.)

Mexico.

CANANEA & TOPOLOBAMPO.—Surveys being made for this proposed line, which is to be built from Cananea, State of Sonora, Mexico, to Topolobampo, Sinaloa, 430 miles, giving an all-Mexican route from Cananea to the City of Mexico. Surveys are reported finished from Cananea to Minaca, Chihuahua, 225 miles. W. C. Greene, President of the Cananea Copper Co., will build the road.

*CANANEA, YAQUI RIVER & PACIFIC.—Concession granted by the Mexican Government with power to build from Naco, Arizona, via Cananea, to Villa de San Marcial, and thence south to the mouth of the Yaqui River, and eventually to the port of Topolobampo. Road in operation to Cananea, 40 miles. No further extension at present. The Greene Consolidated Copper Co., which operates extensive copper mines at Cananea, is interested.

*CHIHUAHUA & PACIFIC (KANSAS CITY, MEXICO & ORIENT).—Branch line from La Junta, via San Isidro, Santa Tomas, Tekalocochik and Metachic, to Temosachic, 55 miles, under contract to Ryan & Dudley, Chihuahua. Grading completed for 40 miles and track laid for 20 miles. H. W. Edwards is Chief Engineer.

COAHUILA GULF.—Incorporated in New York to build and operate a railroad in Mexico. The proposed route is not stated. J. F. Garner, G. Foster Peabody and E. M. Shepard, all of New York, are named as incorporators.

*COATZACOALCOS, YUCATAN & GUATEMALA.—New line from Coatzacoalcos, in the State of Tabasco, Mexico, through Campeche to Merida, in the State of Yucatan, 600 miles. Work in progress. P. O. Saunders, Mexico City, is interested. (Mar. 11, 1904.)

CULIACAN COAST LINE.—Projected line to run from Hermosillo, in the State of Sonora, to the Port of Culiacan, in the State of Sinaloa, about 1,200 miles. The general offices of the company will be located at Hermosillo. The road will pass through large timber and mineral regions in the States of Sonora and Sinaloa.

EL PASO & SOUTHWESTERN.—Surveys in progress for a proposed extension from Nacozari west to Topolobampo, on the Pacific coast of the State of Sinaloa.

FERROCARRIL MINERAL.—Reported that this road, which runs from Chihuahua to the Santa Eulalia mining camp, 15 miles, is to be changed from narrow to standard gage.

GUAYMAS & SAN MARCIAL.—Extension of one year granted for building this projected line from Guaymas, on the Pacific coast of the State of Sonora, to San Marcial, 85 miles. The original concession was granted to the company in 1889 and expired on August 24 of last year. According to the new concession, the company must complete 10 miles of track within one year from that date. The remainder of the road must be completed within four years.

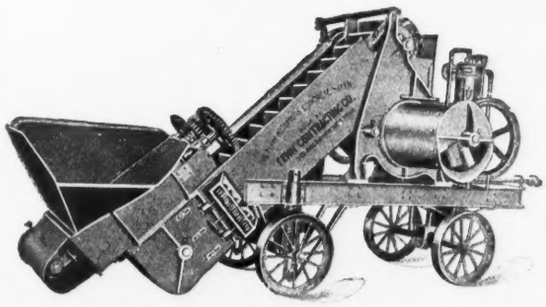
HIDALGO & NORTHEASTERN.—Surveys in progress for an extension of this road to the port of Tuxpan, on the Gulf of Mexico, about 150 miles. The road is now completed and in operation from the City of Mexico to Venta Colorado, 125 miles. Antonio Caso is Chief Engineer.

*HORNOS RAILROAD.—Extension from Hornos Ranch to the Mazapil mining district, 100 miles. Completed to Viesca, 12 miles from the Hornos Ranch. (Mar. 11, 1904.)

INDUSTRIAL RAILROAD CO.—Application will be made to the Mexican Government for a concession to build a system of railroads through rich agricultural districts in the State of Vera Cruz.

*KANSAS CITY, MEXICO & ORIENT.—Grading completed for 75 miles east of Chihuahua, 40 miles west of Minaca and 75 miles east of Topolobampo (Port Stillwell). Track laid for 35 miles east of Chihuahua and for six miles south-

THE FENN AUTOMATIC CONCRETE MIXER



Guaranteed to make more first-class concrete, with less labor, than any machine ever manufactured.

It is entirely automatic, measures proportions, and will give a perfect mix with either stone or cinders.

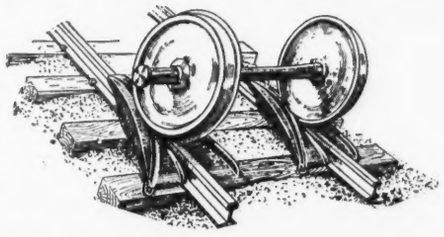
FENN CONTRACTING CO.
1125 Broadway, New York

DOBBIE FOUNDRY & MACHINE CO.
Niagara Falls, N. Y.

T. MILTON SHAFTO
322 Land Title Building
Philadelphia, Pa.

GORDON ENGINEERING CO.
1127 Union Trust Building
Cincinnati, Ohio

THE JOHNSON CAR REPLACER



The strongest, simplest, safest and most reliable Replacer on earth.

Works on any kind of road bed, including ice, snow, cinders, paving, plank or mud. Requires but one tie, as it is supported by the rails at both ends.

Highest Award on Car Replacers at the Louisiana Purchase Exposition, 1904.

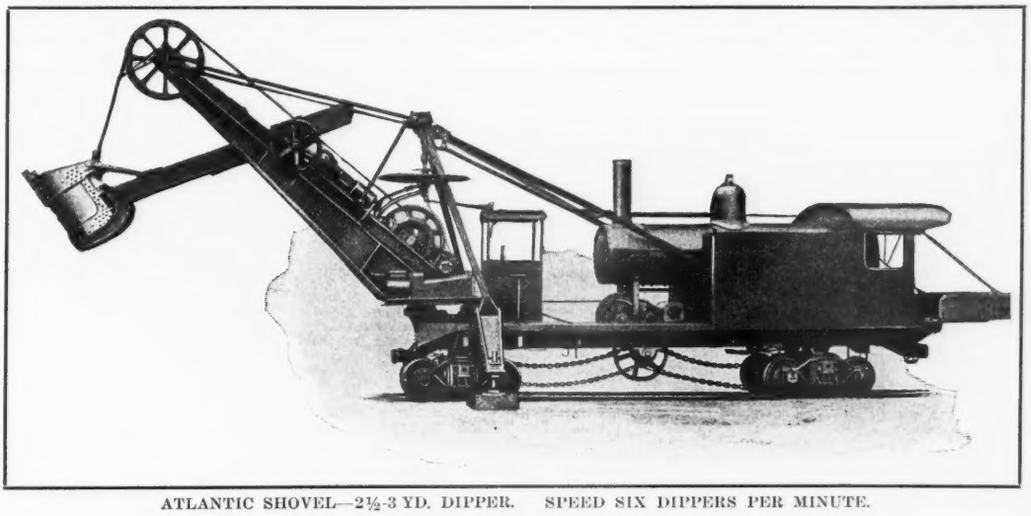
Large numbers in actual use, one road having over 500 pair in actual use. Hosts of testimonials. A record of replacing a completely derailed 192,000-lb. compound engine in one and three-quarter minutes, from commencing to set the frogs until the engine was replaced and frogs removed from rail. Every frog guaranteed in quality and efficiency.

THE JOHNSON WRECKING FROG COMPANY
526 Citizen's Building — CLEVELAND, OHIO, U. S. A. — JOHN MACKENZIE, Pres.

ATLANTIC EQUIPMENT COMPANY

Railway Exchange
CHICAGO

25 Broad Street
NEW YORK



ATLANTIC SHOVEL—2½-3 YD. DIPPER. SPEED SIX DIPPERS PER MINUTE.

Steam Shovels and Dredges

Built and Guaranteed by AMERICAN LOCOMOTIVE COMPANY

A. W. ROBINSON, M. E., Consulting Engineer

New Saddle Tank Contractor's Locomotives in Stock

Elevated Railway and All Other Types of Locomotives

CARS **RAILS** **BRIDGES**

west of Minaca. For work in Texas, Oklahoma Ter. and Kansas see Kansas City, Mexico & Orient under United States. Also see Chihuahua & Pacific.

*LA DICHA & PACIFIC.—Incorporated in the City of Mexico, with a capital of $2,000,000 and principal office at La Dicha, State of Guerrero, in the interests of the Mitchell Mining Co., of La Dicha and New York, to build a narrow-gage road from the company's copper properties at La Dicha west to Port San Marquez, 12 miles south of Acapulco, on the Pacific coast of the state of Guerrero, 75 miles. Maximum grades are to be 1½ per cent. Work reported in progress and several miles already graded. On the completion of the line the company plans to erect a 1,000-ton smelting plant at Port San Marquez. It is said that the Mexican Central will extend its Cuernavaca line south from the Balsas River to Chilpancingo, to which place it is the intention of the La Dicha & Pacific Company eventually to extend its line, thereby making a new through line from the City of Mexico to the Pacific coast at Port San Marquez. George Mitchell, of the Mitchell Mining Co., is one of the directors, and R. E. Morrison, of the City of Mexico, is Vice President and General Counsel.

*LINARES & GULF.—An officer writes that this road, which is being built by the San Carlos Copper Co. from Linares, State of Nuevo Leon, on the Mexican Central, via San Jose and Tamaulipas to the Gulf of Mexico, will be completed from Linares to San Jose., 40 miles, by July. Six miles of track is already laid. On the last 10 miles of the line, the work is very heavy. The road is to be standard gage, with masonry bridges and abutments. There will be steel girders on bridges under 23 ft. long. Frames of larger bridges will be creosoted. Edward D. Self is Chief Engineer.

MERIDA & PETO (YUCATAN).—This company has been granted a concession to build an extension from a point on the main line to Villa de Satula, 80 miles. R. G. Canton, Merida, Yucatan, is President and General Manager.

MEXICO & MICHOACAN.—Concession granted to this company to build a railroad from San Geronimo, in the State of Michoacan, easterly and northerly to the town of Apuleo, on the Mexican Central, in the State of Hidalgo. The company also plans to build a line to the port of Tuxpan, on the Gulf of Mexico, and to build a number of extensions. Edmund Power is President; Jose Arce, Vice President, and Leonides C. Bash, Secretary and Treasurer, all of the City of Mexico.

MEXICAN CENTRAL.—Short line from Apulco, State of Hidalgo, the terminus of the Apulco branch of the Panuco Division, north to the port of Tampico on the Gulf of Mexico, 130 miles. This would greatly shorten the line between Mexico City and Tampico, which at present is 780 miles. By the proposed line the distance would be about 240 miles.

——Work to be resumed this spring on the extension of the Zapotlan branch from Tuxpan, 17 miles south of Zapotlan, State of Jalisco, to Colima, 30 miles. Connection will be made at Colima with the road which runs to Manzanillo.

——Extension of the Cuernavaca line along the Balsas River to Chilpancingo, 20 miles. Authorized. See La Dicha & Pacific.

——Extension from Balsas, the present terminus of the Cuernavaca line west and south to Zihuatanejos, State of Guerrero, on the Pacific Ocean, 150 miles. Projected.

——Reported that this company will extend its Guanajuato branch from the present terminus at Marfil to the mining camp at Valenciana, two miles north of Guanajuato, 10 miles.

——Branch line from San Pedro, in the state of Coahuila, north to the coal fields of Las Esperanzas. Concession granted. (Mar. 11, 1904.)

——Cut-off from Salamanca, in the State of Guanajuato, north to Guanajuato, 25 miles. Proposed. (Mar. 11, 1904.)

——Branch line from Gallego, State of Chihuahua, Mexico, northwest to Cananea, 120 miles. Surveys completed. (Mar. 11, 1904.)

MEXICAN INTERNATIONAL.—Extension southwest from Durango, state of Durango, to the port of Mazatlan, State of Sinaloa, on the Pacific coast, 225 miles. Survey approved by the Mexican Government but construction not yet authorized.

——Extension of the Papasquiaro line to the mining camp of Guanacevi, in the State of Durango. Work reported in progress. This will run through one of the richest mining sections in Mexico.

MEXICAN ROADS.—Augustin Arroyo de Anda, a lawyer of the City of Mexico, is reported to have agreed to deposit $60,000 in Mexican Government bonds to guarantee the building of a railroad from Dolores Hidalgo, state of Guanajuato, on the National of Mexico, west to Guadalajara, 180 miles. The Mexican Government is said to have assured the necessary concession.

——Surveys in progress for a railroad, 20 miles long, to connect the asphalt deposits near San Felipe, 100 miles southwest of Tampico, with Cuenillos, on the Poncochin River, which connects with the Tamiahua lagoon. P. W. Henry, representing the Pan-American Asphalt Co., of New York, is in charge.

——The State of Chihuahua has granted a concession for a railroad from San Isador to Cerro de la Calera, in the Guerrere mining district of that state.

——A railroad is projected from Santiago Papasquiaro, in the state of Durango, on the Tepehaunes branch of the Mexican International, to the San Andres mining district. The San Andres Mining Co. is interested.

——The San Francisco del Oro Mines, Ltd., with headquarters at 65 London Wall, London, England, is planning to build a railroad from its mines, situated in the Parral district of Mexico, to a connection with either the Mexican Central or the Parral & Durango. James E. Hyslop is General Manager.

——The Mexican Government has granted a concession to the Calera Mining Co. to build a road from its mines to a connection with some railroad. Surveys have been made and approved.

——The Mexican Government has granted a concession for a railroad from Alamos, state of Sonora, northwest to the port of Guaymas, 150 miles.

——A concession has been granted by the Mexican Government to Col. José H. Hampson, of the City of Mexico, to build a railroad from Rancho del Guarda, in the Federal district, to Canada de Nepanepa, in the state of Morelos. Surveys to be begun at once and the road completed within three years.

——*Proposed extension of the Mexican Coal & Coke Co.'s line from Las Esperanzas, State of Coahuila, to Nogalitas, 24 miles. Surveys finished. Messrs. Hampson & Smith, City of Mexico, are the contractors. G. A. Stranahan is the engineer in charge.

——The Occidental Construction Co. has been granted a subsidy and concession by the Mexican Government to build a road from Guaymas, state of Sonora, to Guadalajara, state of Jalisco. Work is to begun at Culiacan, the capital of Sinaloa. From Culiacan to Mazatlan the road has been surveyed. Later, work will be begun on the line north from Culiacan to Guaymas and on that south from Mazatlan to Guadalajara. Lewis Warfield, of New York City, is a director, and Harold R. Miller, Secretary.

——Reported that Arthur E. Stilwell, of Kansas City, Mo., and others who are interested in the Kansas City, Mexico & Orient Railroad, have acquired a concession which was granted recently to Juan Ochoa Ramos, of the City of Mexico, for the construction of two railroads in the state of Mexico; one from Toluca, state of Mexico, southwest by way of Tenango and Tenancingo to Zacualpan, and the other from Toluca west through two mountainous districts to the City of Morelia. Each of these lines will be about 100 miles long.

——Concession granted to General Augustine Pradillo to build a railroad from Zitacuaro, in the state of Michoacan, east to the town of Jocotusco, near the City of Mexico, 85 miles. Under the terms of the concession, the road must be completed within three years.

——The Rothschilds, of Paris, who own the Inguaran copper mines in the state of Michoacan, are having a survey made for a railroad which they propose to build from the mines north to a connection with the National Railroad of Mexico at Patzcuaro, 60 miles. Carlos Eisenmann, of the City of Mexico, is in charge of the preliminary work.

——Concession granted to John J. Moylan, of the City of Mexico, to build a railroad from San Angel, state of Mexico, southwest, passing through the towns of Tizapan, San Geronimo and Magdalena to the town of Cienegaillas, in the state of Mexico. The construction of branch lines is also authorized.

——Concession granted to Davis Richardson to build a standard gage railroad in the state of Sonora from Guaymas, on the Gulf of California, along the Yaqui River through the Dura mining district to Tonichi, in the Sahuaripa mining district. According to the terms of the concession, surveys must be begun within six months.

——*Government military railroad in the new territory of Quintnana Roo, in the state of Yucatan, from the town of Chun Chen, Santa Cruz, to a point on the Gulf coast, to be finished this summer. This road will afford a means of transporting troops into the territory in times of Indian disturbances.

——*The Agostitlan Coal Co., Ltd., is building a narrow-gage railroad from Irimco on the National of Mexico to Agostitlan, in the State of Michoacan, a distance of 32 miles. About 20 miles have already been graded.

——Projected lines reported from Chilpancingo to the City of Mexico on the north and to the port of Acapulco on the south. Surveys will soon be begun. Governor Emmanuel Guillen, of the State of Guerrero, is said to be interested.

——The El Oro Mining & Railroad Co., which has obtained a concession from the Mexican Government for building a railroad from Tultenango to Toluca, 65 miles, will soon place surveyors in the field.

——The Mexican Government has granted a concession to B. H. Moffat, President of the Denver, Northwestern & Pacific, and a number of other capitalists, for building a railroad 1,500 miles long in Mexico. The proposed route is from Agua Fria through the State of Sonora to the Gulf of California and thence to the Port of Topolobampo, where connection will be made with the Kansas City, Mexico & Orient, now building.

——Application made to the Mexican Government for a concession to build a railroad from Morelia, State of Michoacan, east to Magdalena, State of Mexico, 80 miles.

——The American Mexican Lumber Co., which has acquired extensive timber lands in the western part of the State of Chihuahua, is about to build a railroad from these timber lands to Casas Grandes, on the Rio Grande, Sierra Madre & Pacific, 75 miles. Benjamin B. Cheney, of Boston, Mass., is said to be interested.

——Concession granted for building a railroad 200 miles long from Toluca, Mex., to Canango, with a branch from Toluca to the Sultepec mining district. H. B. Hollins, of New York, is said to be interested.

——The North American & Mexican Development Co. is reported about to build a railroad from Oaxaca to a point on the isthmus of Tehuantepec, 250 miles. W. W. Nelson, Kansas City, Mo., is said to be interested.

——Arrangements reported made for building a narrow-gage railroad between San Marcos, in the State of Tamaulipas, and Berrizabal, about 35 miles. The road will be built in the interest of the Campania Ferrocarril de Cicunvalacion.

——Concession granted to J. Rodger Wahl, of Mexico City, for building a railroad from Tepic, State of Jalisco, to Santiago, on the west coast of Mexico, 80 miles. A 30-mile branch is also projected to San Blas.

——The Sierra Grande Lumber Company, which recently bought about 40,000 acres of land in the State of Colima, will build a railroad to connect the lumber mills to be built on this land with the railroad at a point near Colima, about 40 miles.

——*The Monterey Coal & Coke Co., which is an auxiliary of the Monterey Iron & Steel Co., is building a road from Menor, Mex., to the town of Sabinas, 20 miles, where connection will be made with the Mexican International. Vincente Ferrara is President.

——Projected electric railroad 248 miles long from Guadalajara to Morelia. Plans for building completed. The Catholic Bank, of the City of Mexico, is behind the project.

——The Amparo Mining Company plans to build a railroad 10 miles long from its mines to a point on the Mexican Central near Chihuahua. Charles K. Smith is Vice-President of the company.

——The Compania Minera, of Saltillo, plans to build a railroad from its mines, near Mazapil, in the State of Zacatecas, to Bonanza, on the Coahuila & Pacific.

——The Compania de los Ferrocarriles Urbano y Agricola of Oaxaca, Mexico, has secured a concession to build a narrow-gage railroad in the State of Oaxaca from Santa Anita, near the City of San Juan Chapultepec, to Ayoguezco, in the district of Villa Alvarez, 40 miles. According to the terms of the concession, the road must be completed within six years. L. R. Pineda, City of Mexico, is interested.

——Concession granted to Alfredo de Gonzalez, Manager of the La Mariposa Mining Co., to build a railroad from Gallego, State of Chihuahua, on the Mexican Central, to the mines of the company. Surveys in progress and the contracts to be let soon.

——The Tula Iron Works Co. is planning to build a railroad from Sayula, State of Jalisco, on the Mexican Central, to Antlan, 75 miles.

——Concession granted to Thomas McManus, of the Greene Consolidated Copper Co., for building and operating 250 miles of railroad in the northwestern part of Mexico. The main line will be built from a point near Naco to a point on the Mexican Central near the City of Chihuahua. A branch is also projected to a connection with the Sonora branch of the Southern Pacific.

——Concession granted to the Monterey Coal Co. for building two lines in the State of Coahuila. One is to connect with the Mexican International at a point between kilometers 118 and 119 and the other is to connect with the City of Muzquiz. L. J. Schofield, of Las Esperanzas, State of Coahuila, may be addressed.

——Concession granted to Sabastian B. de Mier, Mexican Minister to France, to build a railroad from Hacienda de Atlataxac, State of Puebla, to a point in the State of Tlaxcala, near Guadalupe, 50 miles. Surveys. Grading to be begun as soon as plans have been approved by the Government.

——The Laredo Mining Co. plans to build a railroad from Saltillo, State of Coahuila, to Bayones. C. C. Pierce, Laredo, Tex., may be addressed.

——Concession granted to J. W. Young, of Salt Lake City, for building about 1,500 miles of railroad in Western Mexico. The proposed road is to connect Juarez, on the Texas State line, with Culiacan, State of Sinaloa, and Pacific ports.

——The Guggenheim Exploration Co., which is the Mexican branch of the American Smelting & Refining Co., has approved plans for the immediate building of several lines in Mexico. This company owns a number of mines which are remote from railroad facilities, and cannot be profitably worked until a railroad connection is made with them. (Mar. 11, 1904.)

——Reports state that the Mexican Mining & Exploration Co. will build from a point on the Mexican Central to its mines situated about 60 miles from Parral, Mexico. J. V. Dignowity, San Antonio, Tex., is General Manager. (Mar. 11, 1904.)

——Projected line from the San Jose mines, in the State of Tamaulipas, Mex., to a connection with the Gulf Division of the Mexican Central, 53 miles long. Surveys in progress by the Nichols Chemical Co., New York. (Mar. 11, 1904.)

——The Descubridora Mining Co., Inde, State of Chihuahua, is about to build a line from Inde to its mines. (Mar. 11, 1904.)

——Concession granted to Andrew Mackenzie for building a railroad from Los Xuchiles, in the State of Vera Cruz, to San Juan de la Punta, 15 miles, with a branch from Tierra Blanca to Vera Cruz. The principal office of the company will be at Mexico City. (Mar. 11, 1904.)

——The San Ildefonso Factory Co. has obtained a concession to build from the City of Mexico west to Tlalnepantla, 15 miles, where the factory of this company is situated. (Mar. 11, 1904.)

——New line to be built by the Penoles Mining Co., Mapimi, State of Durango, Mexico, from Mapimi southeast to coal mines, 65 miles. Surveys completed and contract for grading will shortly be let. (Mar. 11, 1904.)

——New line from Moreno, on the Sonora Railroad, to El Satto, 28 miles. Surveys completed. General Chas. P. Eagan, of the Mexican Anthracite Coal Co., is interested. (Mar. 11, 1904.)

——Concession granted to the Mexican Anthracite Coal & Mining Co. to build a line between Cananea, State of Sonora, and a point on the Sonora R. R., about 30 miles. General offices are at Guaymas. (Mar. 11, 1904.)

——The Compania Explotadora de Minas de Carbon de Michoacan proposes building from its coal properties in the State of Michoacan to a point on the National Railroad of Mexico. (Mar. 11, 1904.)

——*New line through the El Oro and Tlal-

MacARTHUR BROTHERS CO.
ENGINEERS AND CONTRACTORS
FISHER BUILDING, CHICAGO

E. L. ADREON, Jr.
President

E. W. HODGKINS
Vice President

D. R. NIEDERLANDER
Sec'y and Treas.

ADREON & COMPANY
(INCORPORATED)

General Railway Supplies and Equipment

IRON AND STEEL

SECURITY BUILDING ST. LOUIS

Engineering and Track
Wolhaupter and Q. & W. Tie Plates.
Chicago Crossing Alarm.
Electric Signals.
Bond Wires and Channel Pins.
Oldsmobile Inspection Cars.
Bryant Rail Saws.
K.-K. Blocker and Derailer.

Miscellaneous
Cast Iron Smoke Jacks.
Dressel Headlights and Lamps.
Bordo Blow-Off Valves.
Bar and Band Iron.
Spring Cotters and Keys.
Chain and Rope.
Perforated Metals.

Mechanical and Car
Fewings' Car Replacers.
Brake Shoes.
Brake Shoe Keys.
Cast Steel Knuckles and Pins.
Acme Pipe Clamps.
Ajax Diaphragms.
Symington Journal Boxes.

QUOTATIONS AND INFORMATION PROMPTLY FURNISHED

pujahua mining districts. Contracts let to Messrs. Byers & King. (Mar. 11, 1904.)

——New line from Xuchiles, in the State of Vera Cruz, to Juan de la Punta. Concession granted and surveys are now being made. (Mar. 11, 1904.)

——The Mexican Flume & Lumber Company will begin work at once on a road from Quirlo, in the State of Michoacan, Mexico, southeast 15 miles, to timber lands owned by the company. (Mar. 11, 1904.)

——Concession granted to Luis Garcia Teruel to build from San Marcos, in the State of Tlaxcala, southeast to Sosendo, Marquez. (Mar. 11, 1904.)

——Concession granted to Luis Torres, City of Mexico, to build from a point near Naco through the Sonora and Moctezuma districts to a point near Los Pilares. (Mar. 11, 1904.)

——Concession granted for a railroad from Tlalpajahua, in the State of Michoacan, to Angangueo. Preliminary surveys in progress. (Mar. 11, 1904.)

——The Nogales Copper Co. will build from Magdalena, in the State of Sonora, Mexico, to its mines, 40 miles. (Mar. 11, 1904.)

——The Industrial Transportation Co. has obtained a concession to build from Atasa, in the State of Tabasco, northwest to Paso del Carrizal. Work will soon be begun. (Mar. 11, 1904.)

——Concession granted to a syndicate of Mexican capitalists to build a railroad from Salamanca, in the State of Guanajuato, northeast to San Juan de Vega, 30 miles. Surveys in progress. (Mar. 11, 1904.)

——Company organized to build from Altata, in the State of Sinaloa, Mex., to the mining district of Topia, 80 miles. Surveys in progress and contracts for grading will be let in the spring. D. Almada, of Altata, Mex., is interested. (Mar. 11, 1904.)

——Concession granted to F. M. Aquilar, Hermosillo, Mexico, to build from Hermosillo, State of Sonora, to Villa de Seris, 30 miles. (Mar. 11, 1904.)

——Concession to General Julio M. Cervantes to build from San Marco, State of San Luis Potosi, on the line of the Mexican Central to Jiliitla, with a branch to Tamazunchale. (Mar. 11, 1904.)

——Concession granted to the United States Packing Co. to build a railroad from Uruapan, the terminus of the Morelia branch of the National R. R. of Mexico, to Los Reyes, 50 miles. The headquarters of the company are at Morelia. J. W. De Kay is interested. (Mar. 11, 1904.)

——Concession granted to Wenceslao Garcia to build from Oaxaca to Tlacolula, 20 miles. (Mar. 11, 1904.)

*MORELIA & TACAMBARO.—New line from Irapuato, State of Guanajuato, south via Morelia, State of Michoacan, to Tacambaro, State of Michoacan, 125 miles. Grading in progress. A subsidy of $3,000 per kilometer has been granted by the Legislature of the State of Michoacan. Connection will be made with the Mexican Central at Irapuato, and with the National R. R. of Mexico at Morelia. (Mar. 11, 1904.)

NACOZARI.—Extension from Nacozari, State of Sonora, south to Montezuma, a distance of 56 miles. To be built soon. James Douglass, 99 John Street, New York City, is President.

NATIONAL OF MEXICO.—Branch from a point on the main line through the Rio Lerma Valley, in the states of Guanajuato and Jalisco, east to Guadalajara, 50 miles. Surveys reported. Would parallel the Mexican Central.

——Reported that this company will build a branch 25 miles long from Nuevo Laredo, State of Tamaulipas, to the coal fields of the Monterey Iron & Steel Co., of Monterey, near the Rio Grande River.

——Branch to El Cugnas, in the State of Vera Cruz, where oil fields owned by the Oil Fields of Mexico, Ltd., are situated. Projected.

——Surveys reported in progress for a proposed branch from a point on the line near Matamoras, State of Tamaulipas, to Tampico, 275 miles.

——Reported that application will be made for a concession for an extension of the Morelia branch from Uruapan, State of Michoacan, west to Colima, 100 miles, and from Colima to the port of Manzanillo, on the Pacific coast, 60 miles. The harbor improvements at Manzanillo, which have been in progress for several years under direction of the Mexican Government, will soon be completed, and the Government wishes to extend its system of railroads to that place.

——Proposed extension from Gonzalez Junction to the City of Guanajuato. Reported that roadbed of the San Gregorio Railroad, a narrow-gage road 17 miles long, will be used.

——Branch line 14 miles long from a point on the Monterey-Matamoros branch to the Cerralvo mining district. Projected.

——Branch from the Monterey-Matamoros line to a point on the Rio Grande border about four miles south of Rio Grande City, Tex., to connect with the Hidalgo branch of the St. Louis, Brownsville & Mexico. Projected.

——*Standard gaging and reconstruction of Matamoras branch from Matamoros west to San Miguel, 75 miles. Work in progress.

——Branch from Mexico City to La Blanca mines, 28 miles. Proposed. (Mar. 11, 1904.)

PALMILLAS RAILROAD.—Extension through Ayapasco, Santa Rosalia, Crestones and San Miguel, in the State of Morelos, Mexico, to connect with the Aricola Railroad at El Carmin. Projected.

PARRAL & DURANGO.—Projected extension north from Parral, State of Chihuahua, to El Paso, Tex., 350 miles, and south from La Mesa de Sandia, State of Durango, to Durango, 200 miles. Preliminary surveys reported in progress.

*RIO GRANDE, SIERRA MADRE & PACIFIC.—This road, which is the property of W. C. Greene, and runs from El Paso, Tex., southwest to Terrazas, State of Chihuahua, Mexico, 250 miles, has begun an extension from Terrazas southwest to the new town of Dedrick at the junction of the Arros and Chico rivers, 150 miles. A concession has been granted by the Mexican Government for an extension 150 miles further to the port of Guaymas on the Gulf of California.

*RIO SECO.—New line from Cardenas, on the Grijalva River, in the State of Tabasco, Mexico, to the port of Paraiso. Work reported. Benj. Barrios, of the City of Mexico, and H. L. Ward, Cardenas, are interested. (Mar. 11, 1904.)

SONORA, CHIHUAHUA & MONTEREY.—Organized with a capital of $20,000,000. The promoters include L. M. Goddard, James B. Orman and E. P. Bertochy, of Denver, Colo. The Mexican Government has given the company valuable concessions, but the proposed route has not yet been decided upon. (Mar. 11, 1904.)

SOUTHERN PACIFIC.—Extension of the Imperial branch, which runs from Old Beach, Cal., to Calexico, on the International boundary. Concession granted by the Mexican Government to J. A. Naugle, of Guaymas, State of Sonora, Mexico, to build 300 miles of railroad in Lower California. Obtained in the interest of the Southern Pacific. Reported that construction will be begun soon.

*SOUTHERN SONORA & ALAMOS.—Work to be begun on this line, which is to run from Alamos, State of Sonora, to some point on the Gulf Coast, probably near Santa Cruz, 94 miles. Laselle & Jennings are reported to have the contract for building. The project is said to be backed by a syndicate of New York capitalists.

STANDARD & HERNANDO.—Projected line from Standard to Hernando, 23 miles, with a branch line to a point on the Gulf of Mexico. G. F. Dittman and C. H. Lloyd, Holder, Fla., are incorporators. (Mar. 11, 1904.)

TABASCO CENTRAL.—Organized to build from San Juan Bautista, in the State of Tabasco, north to Nacajuca and from Nacajuca northwest to Cunduacan, both in the State of Tabasco, to a point on the Seco River. Surveys in progress. Policarpo Valenzuela, San Juan Bautista, is President. (Mar. 11, 1904.)

TLACOTEPEC & HUAJUAPAN.—Concession granted to this company to build a railroad from San Marcos, State of Puebla, to Rosendo Marquez. (Mar. 11, 1904.)

TORRES & PRIETAS.—Extension from Minas Prietas, in the State of Sonora, southeast to a point on the Yaqui River, to tap the San Marcial coal fields, which are owned by the Southern Pacific. Plans made.

*TUXPAN VALLEY.—New line in Mexico from Tuxpan to a point at or near Jalsonera, 70 miles. Surveys completed and grading in progress. C. B. Eames, of St. Louis, is President, and Geo. W. Deits, of the City of Mexico, General Manager.

WESTERN OF MEXICO.—Proposed extension from Culiacan, northeast to Topia, in the State of Durango, 70 miles. Sebastian Camacho, Culiacan, may be addressed. (Mar. 11, 1904.)

BRIDGE WORK PROPOSED.

United States.

ALABAMA.

——Both Houses of Congress have passed a bill authorizing the counties of Dale and Houston, Ala., to build a bridge over the Choctawhatchee River.

——On March 2 the United States Senate passed the bill authorizing the Alabama & Western Railroad to build bridges over the Black Warrior River between Green and Marengo counties and over the Alabama River between Clark and Monroe counties, Alabama.

ANNISTON.—A viaduct is to be built on Tenth street.

BESSEMER.—A viaduct is proposed over the tracks at Tenth street, to cost about $30,000.

DECATUR.—The Lower House of Congress, on January 13, passed a bill authorizing the Decatur Transportation & Manufacturing Co. to build a bridge over the Tennessee River at or near Decatur, the plans to be approved by the Secretary of War.

——A large bridge is to be built over the Tennessee River at this place.

HUNTSVILLE.—The Nashville, Chattanooga & St. Louis proposes to build a bridge over the Tennessee River south of Byrd's Bluff. Surveys have been completed and the site of the bridge located.

JASPER.—The Commissioners' Court of Walker County has granted permission to build a steel bridge, which will be the largest in the county, over the forks of the Mulberry and Sipsie rivers and the creek in the eastern portion of the county.

MONTGOMERY.—The Mayor has approved an ordinance providing for a bridge over the Central of Georgia tracks on Madison avenue.

POLLARD.—The United States Senate, on January 21, passed a bill, which is also before the House of Representatives, authorizing the Lindsey Lumber Co. to build a bridge over Conecuh River at Pollard, Escambia County.

STANLEY.—The Birmingham & Atlantic will at once build a bridge over the Coosa River at this place, to replace the present structure.

ALASKA.

SKAGUAY.—The White Pass & Yukon Railway will build three new steel bridges on the line of its road and replace many of the present structures with steel structures.

ARIZONA.

CLIFTON.—The new steel bridge of the Arizona & New Mexico over the San Francisco River, carried away by heavy floods, may be rebuilt.

PHOENIX.—The Maricopa & Phoenix Railroad is making plans to build a bridge to replace an existing structure. About 400 ft. of the Gila bridge belonging to this company was recently carried away by floods and may be rebuilt.

ARKANSAS.

——A bill has been passed by both Houses of Congress authorizing the building of a bridge over the Ouachita River in Arkansas.

BENTONVILLE.—Bids are wanted March 25 by Marion Douglas, County Clerk, for building two steel bridges, one over Sargon Creek and the other over Osage River, in Benton County.

CULBERHOUSE.—The Manila & Southwestern will build a long trestle over the St. Francis River in Craighead County, northeast of this place, on the line of its proposed road between Manila and Culberhouse.

LITTLE ROCK.—A viaduct is proposed over the Iron Mountain tracks at Fort Smith crossing. It is to be the full width of the street, with sidewalks, and is to cost about $25,000.

PINE BLUFF.—A bill has been introduced to secure the building of a viaduct over Third and Fourth Avenues.

POCAHONTAS.—Bids will be asked some time in April by B. A. Brown, County Judge, for building an iron and stone bridge over Eleven Point River. B. F. Spekes is County Clerk.

RICHLAND CENTER.—Bids are wanted May 1, by George Wuling, for building a steel bridge over the Wisconsin River at Tone Rock.

VAN BUREN.—Both Houses of Congress have passed the bill authorizing a bridge over the Arkansas River at or near this place.

CALIFORNIA.

LOS ANGELES.—Plans are ready for replacing with a new structure the Sunset boulevard bridge over Lake Shore avenue, to cost about $17,200.

——Plans are being made for reconstructing the West Riverside bridge, at a cost of about $21,000.

——Plans, it is reported, are being made by A. F. Stafford, City Engineer, for a bridge 400 ft. long to be built on Fourth street.

LOS GATOS.—Plans have been accepted by the Los Gatos Council for building a concrete bridge 180 ft. long and 70 ft. wide, with 12 ft. sidewalks, to replace the present wooden structure over the creek on Main street.

PARKER.—The Atchison, Topeka & Santa Fe may build a new bridge over the Colorado River at this place.

RED BLUFF.—Tehama County may build a bridge 1,550 ft. long over Sacramento River sloughs, with steel tubing and wooden beams, at a cost of $34,000. W. F. Luning is City Engineer.

——The Board of Supervisors has under consideration the question of building two bridges over the stream at the east end of the town.

REDDING.—Petitions have been made for a bridge over the Sacramento River, which will cost about $25,000.

SACRAMENTO.—Application has been made by the Southern Pacific to the War Department for permission to build a bridge over the Carquinez Straits from the Nevada dock to Fifth Street, Benicia. The proposed structure will be more than a mile long, with a draw, and cost about $3,000,000.

——The Board of Supervisors is having soundings made by County Surveyor J. C. Boyd to locate the site for a bridge from the mainland to Grand Island.

SAN DIEGO.—Plans are being made by G. A. D'Hemecourt, City Engineer, for two new bridges, one on Sorento road and the other at the Tecalote Creek.

SAN FRANCISCO.—The bridge at San Jose and Mt. Vernon avenues over the Southern Pacific tracks is to be widened 60 ft., at a cost of about $14,000.

SAN JOSE.—Petition has been made for a bridge on San Antonio street.

SANTA CRUZ.—The Board of Supervisors may ask for new bids for building a steel bridge over Soquel Creek.

COLORADO.

CANON CITY.—The County Commissioners will build a bridge at the lower end of Fruitmere, to cost about $12,000.

COLORADO SPRINGS.—The Atchison, Topeka & Santa Fe may build new bridges at Costilla and Kiowa streets, plans for which have been made by the City Engineer.

DENVER.—Plans are reported ready for building a bridge over Cherry Creek at Lawrence street, to cost about $45,000.

PUEBLO.—The Council has passed an ordinance appropriating $75,000 for a bridge, including a viaduct over the Denver & Rio Grande tracks at South Main street, to cost $95,000.

CONNECTICUT.

BRIDGEPORT.—The New York, New Haven & Hartford will build a new four-track drawbridge over the Housatonic River and three or more others of the same type; one at Cos Cob, one over the Connecticut River and one over Shaw's Cove at New London; also a new three-span bridge between Shelton and Derby, carrying double tracks.

——Bids may soon be asked by A. B. Hill, New Haven, Conn., for building a reinforced 40-ft. concrete arch and approaches over Ash Creek between this place and Fairfield, to cost between $20,000 and $25,000. H. G. Scofield is City Surveyor.

HARTFORD.—The Lower House of Congress has passed a bill authorizing the building of a bridge, without a draw, over the Connecticut River between this place and East Hartford.

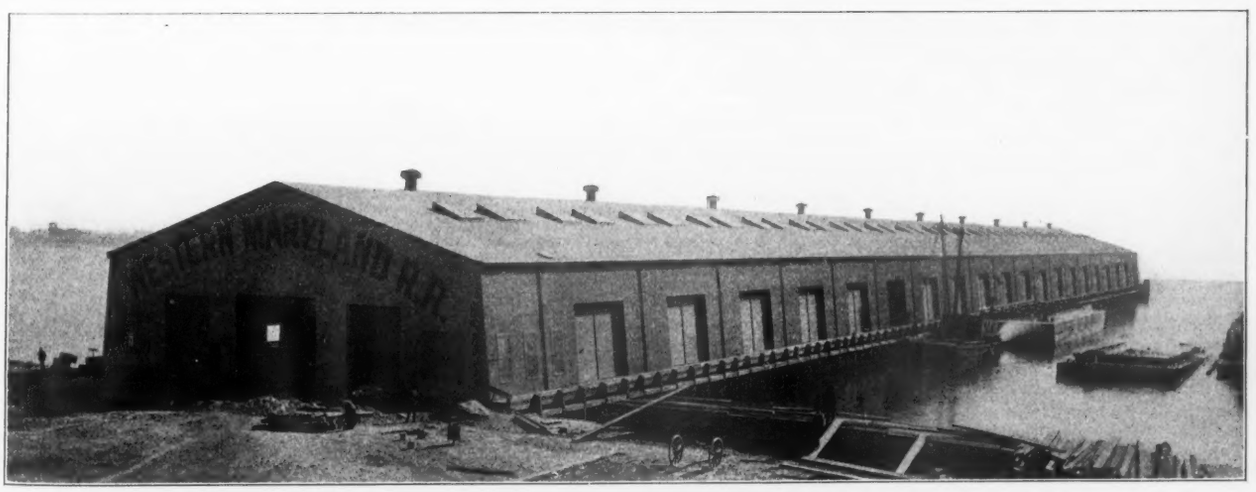
——The Board of Street Commissioners will probably build two bridges this spring; a stone bridge on Albany avenue, to cost $20,000, and a steel bridge over the Central New England tracks, to cost about $30,000.

DOUBLE TRACK SWING AND APPROACH SPANS
N. Y. C. & H. R. R. R.
OVER SPUYTEN DUYVIL CREEK, NEW YORK, N. Y.
Swing Span, 286 ft. 3 in., C. to C. Approach Spans, 106 ft. 3 in. C. to C.
Built in 1899

THE KING BRIDGE CO.,
CLEVELAND, OHIO.

NATHANIEL HAVEN, PRESIDENT H. D. BUSH, MANAGER

BALTIMORE BRIDGE COMPANY
Steel Bridges and Buildings
and Structural Work Generally



FREIGHT PIER SHED
Western Maryland Tidewater Railroad, at Baltimore, Md.
BUILT AND ERECTED BY
BALTIMORE BRIDGE COMPANY, 1904

824 ft. long, 108 ft. wide, 25 ft. high at eaves. Trusses 40 ft. apart, spanning entire width of building. Steel frame, covered with corrugated iron.

GENERAL OFFICES AND WORKS
Bush Street and B. & O. R. R., Baltimore, Md.
New York Office, 128 Broadway

NEW HAVEN.—Plans are being made and work will be commenced this spring on a second bridge over West River on Kimberly avenue, to cost about $16,000. C. W. Kelly is Chief Engineer.

——A new drawbridge will be built at Double Beach, between Branford and East Haven. The Secretary of War has ordered the present structure removed. A. William Sperry is Engineer in charge of the work.

——The New York, New Haven & Hartford will replace the Connecticut River bridge, a single-track structure with a four-track bridge, to cost about $1,200,000. Introduction of heavier equipment will require strengthening of a number of its bridges. C. M. Ingersoll is Chief Engineer, New Haven, Conn.

——Local reports state that the New York, New Haven & Hartford, in addition to building about 11 steel overhead bridges as a part of its four-tracking of the cut in this city, will put up a single-track two-span bridge 113 ft. long on the Danbury branch at Winnipauk; a 630-ft. steel viaduct at Fall River, Mass.; a two-span single-track bridge 117 ft. long over the Norwalk River, at Norwalk; a two-track 70-ft. bridge at Stonington; a 50-ft. single-track bridge at Branchville, on the Danbury branch, and two bridges, 200 and 125 ft., respectively, to be built at Collinsville, on the Northampton Division.

PUTNAM.—The Consolidated Railroad has agreed to stand a share of the cost of widening Front street, which includes an overhead water tight bridge to carry four tracks.

WATERBURY.—A bridge is proposed on the westerly side of the Naugatuck River over the tracks of the New York, New Haven & Hartford.

WILLIMANTIC.—This city has voted $12,000 to build a bridge over the railroad tracks.

——A resolution, it is reported, has been passed by the Board of Aldermen authorizing the making of plans for building a bridge at Main street, to cost $12,000.

——A foot bridge is proposed over the Willimantic River, to cost about $10,000.

DELAWARE.

WILMINGTON.—Petition has been made for a bridge over Brandywine Creek at Church street to connect with Locust street.

DISTRICT OF COLUMBIA.

WASHINGTON.—Plans for the bridge to be built by the Baltimore & Ohio to carry New York avenue, northeast, over its tracks have been approved by the District Engineer. They call for a structure 600 ft. long and roadway of 50 ft., with sidewalks 12 ft. wide, of steel construction covered with concrete, to cost about $175,000.

——Both Houses of Congress have passed the bill authorizing the Leckrone & Little Whiteley Railroad Co. to build a bridge over the Monongahela River in Pennsylvania.

——The District Commissioners may rebuild the Anacostia bridge, at a cost of about $250,000; also build a new bridge over Piney Branch on Sixteenth street, to cost about $50,000. W. J. Douglas is District Engineer of Bridges.

——A bill has been introduced in the United States Senate authorizing a bridge across Rock Creek at Q street, N. W., Washington, D. C.

——The K street bridge over Rock Creek may be rebuilt, at a cost of $20,000.

——The Commissioners have approved the plans of the Philadelphia, Baltimore & Washington for its railroad bridge over Walter street.

——Plans are being made for the New York avenue bridge, which will be 500 ft. long, carrying that avenue over the proposed series of tracks in the Eckington yards; the estimated cost is $150,000. The proposed T street bridge will be 24 ft. wide and 650 ft. long, to cost $175,000.

——An amendment to the Sundry Civil bill has been proposed providing for an appropriation of $500,000 for building the memorial bridge over the Potomac River. The proposed structure will be about 3,500 ft. long, with approaches, and will consist of six main spans 192 ft. each, one span of 159 ft. and a number of smaller spans.

——The Lower House of Congress on February 11 passed the bill, previously passed by the Senate in March, 1904, providing that the time limit for building the highway bridge over the Potomac River be extended to February 12, 1906.

——Bids are wanted March 23, by Smith S. Leach, Lieut. Col. Engineers, for building an earth embankment approachment to the highway bridge over the Potomac River.

——The Senate Committee has increased the limit of cost of the Anacostia bridge and authorized the building of the Piney bridge on Sixteenth street, to cost $50,000.

——Work will be continued on the Connecticut avenue viaduct, for which $394,000 is available.

FLORIDA.

——A bridge is proposed over St. Andrews Bay near Grassy Point.

JACKSONVILLE.—An ordinance has been passed to issue bonds for building a bridge over the Hillsboro River, to cost $25,000.

——Application has been made to the War Department for permission to build a bridge over the river at the foot of Twelfth street.

GEORGIA.

ALBANY.—The Georgia Northern is planning to build a bridge over the river at a point known as the Narrows, about a mile above the Atlantic Coast Line bridge.

ATHENS.—The County Commissioners will build two large steel bridges; one over Elk River at Redusshoal, in the northern part of the county, and the other over Limestone Creek at the Huntsville and Brown Ferry road, in the southern part of the county.

ATLANTA.—The Southern will build a new bridge from Madison street to the west end of the present bridge.

——A 600-ft. steel bridge will be built over Chattahoochee River at Pace's Ferry, nine miles from Atlanta, between Fulton and Cobb counties.

E. B. Rosser, Chairman, Road and Bridge Committee.

——The Bridge Committee recommends the completion of the Magnolia street bridge, at a cost of $9,000; the completion of the approaches to the Powell street underpass, to cost $4,250; for the approaches to the South Boulevard underpass, to cost $14,000, and that a sum of not less than $25,000 be appropriated to begin work on the Washington street viaduct.

——The city will build a reinforced concrete bridge at Edgewood avenue, for which bids will be asked about April 1, to cost about $60,000, to replace the present structure.

——The railroads may build a viaduct from Hunter street to Gilmer street, at a cost of about $125,000, for which plans have been made by R. M. Clayton, City Engineer.

AUGUSTA.—The City Council is protesting against the order of the War Department requiring that all bridges over the Savannah River shall be built with draws not less than 80 ft.

——A steel bridge may be built over the river at Center street.

COLUMBUS.—Bids are wanted April 4 by the Commissioners of Roads and Revenues for building two steel highway bridges and piers over Randalls Creek, one 110 ft. long, with 54-ft. steel approaches, and the other 125 ft. long, with 54-ft. steel approaches, in Muscogee County.

——The Georgia, Florida & Alabama, to enter this place, may build two bridges over the river.

CONCORD.—The Baltimore & Ohio may build a new overhead bridge.

MACON.—Plans are being made for putting up a concrete arch over the Southern & Macon and Dublin & Savannah tracks.

——The Central of Georgia may put up a bridge at Walnut street.

——An ordinance is before the City Council providing for building a steel viaduct over the tracks at Seventh street 32 ft. wide, with a roadway of 20 ft. and 6-ft. sidewalks, to be built under the supervision of the City Engineer.

SAVANNAH.—Petition has been made for a bridge over the Savannah River.

SWAINSBORO.—Several bridges over the Ohoopee River in Emanuel and Tattnall counties, which have been carried away by recent floods, at a loss of about $200,000, may be rebuilt.

IDAHO.

——The bill authorizing the Spokane International Railway Co. to build bridges over Pend d'Oreille and Kootenai rivers, in Kootenai County, Idaho, has been passed by both Houses of Congress and signed by the President.

BONNER'S FERRY.—A bridge is proposed over the Kootenai River, to cost about $30,000.

MOSCOW.—The County Commissioners are asking bids April 19 for building a bridge over Bear Creek; also for one over Paradise Creek. A. P. Ramstedt is County Clerk.

WALLACE.—The Northern Pacific is planning to build a bridge during the spring over the Columbia River on its Idaho Division, to consist of 10 steel spans. About 20 other bridges will also be built by this company.

ILLINOIS.

——On January 31, the United States Senate passed the bill, previously passed by the House of Representatives, authorizing the Kensington & Eastern Railroad to build a bridge over the Calumet River, in Cook County, Ill.

CHICAGO.—The City Bridge Engineer writes that the following 10 bridges over the Chicago River and its branches should be rebuilt: Archer avenue, North avenue, North Halsted street (Canal), Fuller street, Chicago avenue, Erie street, Indiana street, Kinzie street, Belmont avenue and Weed street. A total appropriation of $2,435,000 has been asked for new bascule bridges at these points.

——Appropriations of $25,000 and $50,000, respectively, for a temporary bridge over the Calumet River at Torrence avenue and for removing the 18th street bridge to S. Western avenue and building a new substructure have been asked for.

——The contract for the new Archer avenue bridge has been awarded and work will soon be commenced. The total price bid for substructure and superstructure was $145,304. Thos. G. Pihlfeldt is City Bridge Engineer.

——There will be a large number of bridges built to complete the work of elevating the railroad tracks within the city limits. There are three years yet in which to finish the work. John O'Neill is Superintendent of all track elevation work.

——That part of the Chicago River between the Lake Front and Ashland avenue, which has been adopted as the channel of the Chicago Sanitary and Ship Canal, is crossed by 28 drawbridges and these are under the jurisdiction of Isham Randolph, Chief Engineer. Those yet to be replaced are:

——Rush Street Bridge.—No plans formulated, but the substitution of a bascule structure by the Sanitary District is contemplated.

——Dearborn Street.—Swing bridge in state of dilapidation and early substitution of a bascule structure in contemplation, for which plans are ready.

——Clark Sreet.—Swing bridge, eventually to be replaced by a bascule structure. No plans under advisement.

——Wells Street.—A double deck swing bridge, first deck used for street traffic, upper deck used by Northwestern Elevated Railway. Here a bascule structure does not seem practicable, and the probable solution is a bridge of existing type and greater span to give required waterway. No plans under consideration.

——Lake Street.—Another double deck bridge, all conditions same as at Wells street, and same remarks apply.

——Washington Street.—A swing bridge with center pier on crown of tunnel. No reconstruction is contemplated here pending a solution of the tunnel problem.

——Madison Street.—Swing bridge in good repair. The substitution of a bascule structure is within the scope of the district project. No plans are under consideration.

——Adams Street.—A swing bridge with one navigable opening, west arm swings over land. The widening of the river and substitution of a bascule structure is contemplated. No plans now under consideration.

——Jackson Boulevard.—A swing bridge with but one navigable channel. Same conditions and remarks as Adams street.

——Polk Street.—A swing bridge, the oldest metallic bridge on the river. Plans for a bascule bridge are now ready, but building is delayed by the conditions at Harrison street, as it is not the policy of the district to build two adjacent bridges at once; this in the interest of city traffic.

——Twelfth Street.—A swing bridge; to be replaced by a bascule structure. No plans yet adopted.

——St. Charles Air Line double track swing bridge. No plans have been formulated by the district for its removal.

——P., Ft. W. & C. Ry. double track swing bridge. Rumor has it that the railroad company has plans for a four-track structure to replace the one now in service.

——Twenty-second Street.—A swing bridge in bad repair will be replaced by a bascule structure as soon as possession can be obtained of the site.

——Halsted Street Lift Bridge.—No plans now under advisement.

GALESBURG.—Bids for seven new bridges in Elba township have been rejected and new ones may soon be asked by the Bridge Committee of Knox County Board of Supervisors.

HARVEY.—The Blue Island, Riverdale & Hammond Electric road, it is reported, will build a new bridge over the Calumet River.

SPRINGFIELD.—The Baltimore & Ohio Southwestern is reported planning to put up a steel bridge 815 ft. long over the Okaw River, at a cost of about $80,000.

STERLING.—A bridge will be built over Rock River, to cost about $70,000. J. D. Arey is City Engineer.

——It is reported that the War Department has ordered the removal of four bridges over Rock River, which were built without the authority of Congress.

INDIANA.

——Congress has passed the bill authorizing the Southern Indiana Railway to build a drawbridge over the Wabash River, in Vigo County.

——A bill has been passed by both Houses of Congress authorizing the Vincennes, West Baden & Louisiana Traction Co. to build a railroad bridge over White River, between Harrison township, Knox County, and Washington township, Pike County, the plans to be approved by the Chief of Engineers and the Secretary of War.

ALBION.—Bids are wanted by John L. Henry, Auditor, for building three steel and concrete bridges in Noble County. J. T. Johnson is Superintendent of Bridges.

BEDFORD.—Bids are being asked by Walter L. Ourus for building a steel bridge at Riverside, in Lawrence County.

BLUFFTON.—The County Commissioners, it is reported, are asking bids for building 16 new bridges this year in Wells County.

CRAWFORDSVILLE.—The Northwestern Traction Co. is reported making plans to put up a viaduct over the Vandalia Railroad, on which work is to be begun this spring.

CRISMAN.—Bids are about to be asked by the Commissioners of Porter County, Valparaiso, Ind., for putting up a steel bridge on concrete abutments. S. P. Corboy is Auditor.

ELWOOD.—The Council has authorized the building of bridges on North Sixteenth, South Twenty-seventh, Main and South B streets.

FORT WAYNE.—Residents have petitioned the County Commissioners to build a bridge over St. Marys River midway between the Wells street bridge and the Vanburen street bridge.

INDIANAPOLIS.—Improvements to be made during the present year include the building of four new bridges over the canal.

——The City Council has made appropriations for building a bridge over the canal and Broad Ripple, retaining walls to Fall Creek bridge at Hammond's Park and for repairs to the West Washington street bridge over White River.

KEYSTONE.—Bids are wanted April 6, by C. S. Brineman, Auditor, Bluffton, Ind., for building an iron bridge 160 ft. long over the Salamony River in Wells County. Bids may also be asked at the same time for building 15 additional concrete bridges.

LAFAYETTE.—A bridge may be built by the Cleveland, Cincinnati, Chicago & St. Louis over the Wabash River in the southern part of the city.

MARION.—The bridge over the Mississinewa River at Washington street is to be rebuilt.

RICHMOND.—Negotiations are under way between the city and the railroad company to jointly build a viaduct on West Second street.

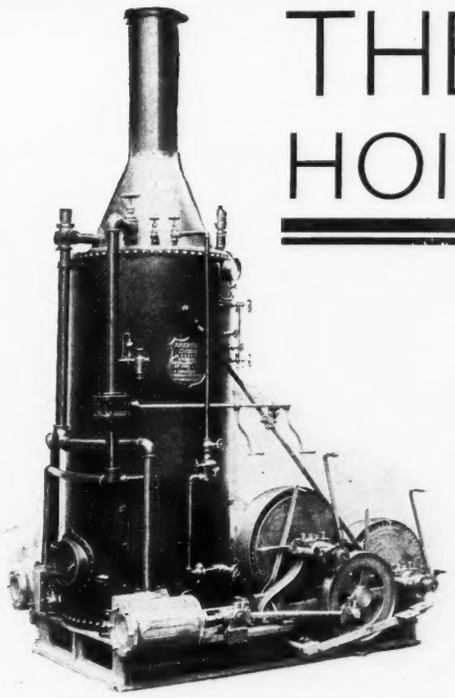
TERRE HAUTE.—On March 28, the United States Senate passed a bill authorizing the County Commissioners of Vigo County to build and maintain a wagon, foot and electric car bridge over the Wabash River at the foot of Washington avenue.

——The Southern Indiana proposes to build two bridges over the Wabash River.

WABASH.—Bids are wanted April 6, by W. S. Davis, County Auditor, for building a concrete or steel bridge on the boundary line between Eel River and Stockdale.

INDIAN TERRITORY.

CHICKAKASHA.—Surveys are reported to be made by the Rock Island to locate the site for a new bridge over the South Canadian River.



THE "AMERICAN" HOISTING ENGINE

HIGH GRADE Hoisting Machinery costs less than the other kind if you count REPAIR and MAINTENANCE BILLS. ¶ ULTIMATE ECONOMY demands HIGH GRADE equipment at relatively high first cost. The larger initial expenditure is a Live Asset profitably invested ∴ ∴ ∴ ∴ ∵ ∴

For Derricks, Pile Driving, Bridge Erecting

Built with a Friction guaranteed not to STICK, SLIP or WEAR OUT

American Hoist and Derrick Co.

ST. PAUL, U. S. A.

Chicago New York Boston New Orleans San Francisco

LAMBERT

Standard Contractors' Hoist with Lambert Patent Swinging Gear.

Steam and Electric Hoisting Engines and Cableways

Are strictly Up-to-Date and Built for Business and Adapted for

Bridge Building, Pile Driving, General Contractors, Hod Hoisting, Mining, Quarrying, and other Hoisting and Conveying Purposes

LOG SKIDDERS AND LOADERS
FOR PINE, CYPRESS AND HARDWOODS

Steel and Wood Derricks and Derrick Fittings

SEND FOR CATALOG No. 50

LAMBERT HOISTING ENGINE CO.

Main Office and Works: 115-121 POINIER STREET, NEWARK, N. J.

NEW YORK CITY BOSTON PHILADELPHIA BALTIMORE ALLEGHENY CLEVELAND CHICAGO ST. LOUIS ATLANTA NEW ORLEANS

near this place to replace the one carried away by floods last summer.

MUSKOGEE.—A viaduct is to be built over the Missouri, Kansas & Texas tracks in this city, to cost about $30,000.

IOWA.

ANAMOSA.—The Chicago, Anamosa & Northern will build six large steel bridges over the line of its road between this place and Waterloo.

CEDAR RAPIDS.—Plans are being made to build a steel concrete arch bridge of eight spans at Second avenue over the Cedar River and the island, making two structures 322½ ft. long, of four spans each, with a roadway of 30 ft. and 6-ft. walks, to cost about $80,000. W. W. Chery is Chairman of the Board of Public Works.

COUNCIL BLUFFS.—A bill is before Congress for a bridge to be built over the Missouri River by the Central Railroad & Bridge Co., connecting this place and Omaha. Address S. B. Wadsworth, President, Council Bluffs.

——A concrete arch may be built over Indian Creek at Frank street. S. L. Etnyre is City Engineer.

DES MOINES.—Plans for the completion of the Melan arch at Sixth avenue are being made and bids are wanted March 18 for two 70-ft. arches and two concrete retaining walls, at a cost of $25,000. The total cost of the bridge will be about $100,000.

——Plans have been made for building a new concrete and steel bridge, of three fixed spans, 120 ft. each, over the Des Moines River at Locust street, to cost about $135,000, but no order for this work has been made by the Council.

——A viaduct has been proposed and plans submitted to the City Council last year to be built over the railroad tracks on West Seventh street; other locations were also suggested but nothing has been done. John W. Budd is City Engineer.

——The Interurban Railway, it is reported, will build a steel bridge over the Des Moines River, to cost about $50,000.

——Plans have been submitted to the City Engineer for a Melan arch over the Des Moines viaduct over the tracks at Vine street, at a cost River.

——Plans are reported ready for building a of about $180,000.

HARVEY.—Work, according to reports, will be begun at once by the Chicago, Rock Island & Pacific on a new bridge over the Des Moines River at this place, to cost $40,000.

IOWA CITY.—The State University of Iowa is making surveys for a large bridge to be built over the Iowa River at Scales Bend, to consist of two spans of 135 ft. each.

MADRID.—The bridge over the tracks of the Chicago, Milwaukee & St. Paul is to be rebuilt at once.

MARSHALLTOWN.—Residents are petitioning the Railroad Commissioners to change the site for the proposed railroad viaduct from Center street to South Third avenue.

MISSOURI VALLEY.—It is reported that work will soon be started to build three new piers in the Missouri River close to the Chicago, St. Paul, Minneapolis & Omaha Blair bridge. It is believed that the present bridge is to be enlarged and double-tracked.

OSCALOOSA.—Plans, it is said, are being made by the Chicago, Rock Island & Pacific for building a steel bridge over the Des Moines River at Harvey, to cost about $40,000.

RUTLAND.—Bids are wanted April 5 by the County Auditor for building a steel bridge 220 ft. long over the Des Moines River in Humboldt County.

SIOUX CITY.—J. M. Lewis, City Engineer, says that the city is planning to build one 40-ft. span bridge with concrete abutments over the Perry Creek and one 130-ft. span over the Floyd. The former structure will be at West Third street.

——Plans are being made for building a steel viaduct 1,080 ft. long, with a 530-ft. filled approach stone or concrete wall, over the tracks at Wall street; work is to be begun this spring.

——A petition has been presented to the Council asking that a viaduct be built over the tracks at Steuben street.

——The Great Northern, reports say, will spend about $1,000,000 in improvements at this place, including the building of a double-track steel structure 7,950 ft. long from the combination bridge over the Missouri River, down Third street, to Division street.

——If the ordinance now before the City Council is passed, the Great Northern will spend about $850,000 in elevating its tracks in this city. The elevated structure will be of steel construction and extend the entire length of Third street.

TRAER.—The Chicago & North Western, local reports state, is building a 500-ft. railroad bridge over Twelve-mile Creek north of this place.

——Work will be begun at once on a bridge over the Iowa River six miles west of Solon, to cost about $9,000.

KANSAS.

EMPORIA.—Plans have been made by County Surveyor Alva J. Smith for building several new bridges in Lyon County; a steel bridge at Badger Creek, 54 ft. long; one at Appleby Ford, 70 ft. long, and a 30-ft. stone arch at Duck Creek.

KANSAS CITY.—A franchise has been granted to a private corporation to build a viaduct over the west bottoms from Sixth street and Bluff street to James street. It is to be 1½ miles long and will cost $1,750,000.

OLATHE.—The Kansas City, Burlingame & Western will build a large number of plate girder and truss bridges along the line of its road from Kansas City to Council Grove, including one large structure over the Neosho River at Council Grove. A. L. Hartridge, Olathe, Kan., is Chief Engineer.

TOPEKA.—The Chicago, Rock Island & Pacific is reported making plans to rebuild its bridge over the Kaw River, at a cost of about $50,000.

——The War Department has approved the plans for the railroad bridge to be built over the Kaw River by the Atchison, Topeka & Santa Fe.

——The Board of County Commissioners will rebuild the Sardon avenue bridge.

——Bonds may be issued for building a steel viaduct over the A., T. & S. F. tracks on Branner street, to cost about $45,000, of which the city of Topeka is to pay one-third. J. F. McCabe is City Engineer.

——About six bridges will soon be built at this place.

——A vote has been passed to issue bonds for rebuilding the Melan bridge over Kansas River.

WESTMORELAND.—The Board of County Commissioners will build four steel bridges in Pottawatomie County. C. A. Grutzmacher is County Clerk.

KENTUCKY.

ARTEMUS.—The Cumberland Railroad is planning to build a bridge over the Cumberland River. C. W. Stone, Warren, Pa., is President.

BARBOURVILLE.—The concrete bridge of the Bell-Jellico Coal Co. over the Cumberland River, recently destroyed by flood, may be rebuilt.

CANTON.—Both Houses of Congress have passed the bill authorizing the building by Trigg County of a free bridge over the Cumberland River, to cost about $25,000.

CLINTON.—Hickman County will build four bridges this year. E. B. Samuel is County Clerk. Clerk.

DANVILLE.—This city has voted to issue $30,000 of bonds for building a bridge. R. C. Brydon is City Clerk.

ERLANGER.—Bids will soon be asked by the Cincinnati, New Orleans & Texas Pacific for building two double-track steel bridges between this place and Cincinnati, to cost $200,000 and $125,000, respectively.

FRANKFORT.—The Frankfort & Versailles Traction Co. is planning to build a bridge over the Kentucky River, near this place. James M. Pickrell, Winchester, Ky., is General Manager.

HICKMAN.—A highway bridge 285 ft. long and 16 ft. wide may soon be built.

LAWRENCEBURG.—Bids will be asked by the Fiscal Court for building a steel bridge about 60 ft. long over Salt River between this place and Anderson. H. S. Wise is County Clerk.

LOUISA.—Both Houses of Congress have passed the bill authorizing the Louisa & Fort Gay Bridge Co. to build a bridge over the Tug and Louis forks of the Big Sandy River.

LOUISVILLE.—The Louisville & Nashville is reported to be putting up 32 new steel bridges on the Kentucky Central Division of its road, which will in future be known as the Cincinnati-Atlanta Division.

MUNFORDVILLE.—A bridge is proposed over Green River at this place, to cost about $40,000.

OWENSBORO.—A large number of bridges carried away by floods in Daviess County may be rebuilt.

SMITHLAND.—Bids are wanted April 5, by Thomas Evans, County Judge, for building a steel bridge over Phelps Creek in Livingston County.

——A railroad bridge is to be built at this place over the river, about 700 ft. long. G. W. Lamdram is interested.

LOUISIANA.

——Both Houses of Congress have passed the bill authorizing the Alexaider Bayou, Macon & Greenville Railway Co. to build bridges oved Red River, Little River and Bayou St. Louis, in Louisiana.

——In the United States Senate, on December 13, a bill was introduced authorizing Caldwell Parish to build a bridge over the Ouachita River.

——On February 25, the United States Senate passed a bill authorizing the Monroe & Lake Providence R. R. Co. to build bridges across Bœuf River and Bayou Macon, in Louisiana.

ALGIERS.—All bids for building a viaduct to carry Newton street, in Algiers, over the tracks of the Southern Pacific have been rejected and new ones may soon be asked. The plans call for a structure 2,306 ft. long from the east side of Bellville street to the west side of Whitney street, with 28-ft. roadway and 6-ft. sidewalks, to carry a single track for electric cars. W. J. Hardee is City Engineer.

BATON ROUGE.—According to reports, the Southern Pacific is planning to build a bridge over the Mississippi River for the joint use of that road and the Gould lines, 'Frisco system and the Missouri, Kansas & Texas road.

BOYCE.—Both Houses of Congress have passed the bill authorizing a bridge over the Red River at or near this place.

COLUMBIA.—The Lower House of Congress on January 9 passed the bill, which had been previously passed by the Senate, authorizing Caldwell Parish to build a bridge over the Ouachita River.

COVINGTON.—High water in the Bogue Chitto River has carried away several large bridges, including the Mizell bridge.

——The Police Jury has decided to build an iron bridge, with a 16-ft. roadway, over the Bogue Falaya River.

HOUMA.—This city will build a steel bridge over the Bayou Terrebonne. H. M. Wallace, Mayor.

JONESVILLE.—A bridge 375 ft. long is proposed over the Little River between this place and Trinity. Address I. E. Mullins.

MONROE.—Two steel bridges will be built over Bayou Bœuf. C. H. Peevy is a member of the Police Jury.

NEW ORLEANS.—The Missouri Valley Bridge & Iron Co., of Leavenworth, Kan., is about to begin work on four bridges, two of which will be of the lift type, over the various basins on the route of the Belt Line, to cost about $100,000.

——At a special meeting of the City Council, it was decided to rebuild the Metairie bridge, and bids will soon be asked for the work.

——Negotiations are under way with the W. W. Bierce Company, Limited, for the building of a steel viaduct, 23 ft. high in the clear, over the tracks of the Southern Pacific. The central section will be 687 ft. 4 in. long, the eastern approach 675 ft. 6 in., and the western approach 942 ft. 9 in. The roadway will be 28 ft. wide, with carrying capacity for a single electric street car track, with a footwalk 6 ft. wide, to cost $54,760. W. J. Hardee is City Engineer.

SHREVEPORT.—The bill authorizing the city of Shreveport to build a bridge over the Red River was passed by the House of Representatives on January 24 and by the United States Senate on January 27.

——The St. Louis Southwestern has given a contract to the Missouri Valley Bridge & Iron Co., of Leavenworth, Kan., for building the piers of its new bridge over the Red River at this place. The bridge is to be 1,250 ft. long, with six spans and a draw, to cost about $250,000.

MAINE.

WESTBROOK.—Residents are agitating the question of building a steel bridge.

WISCASSET.—A bridge is proposed between this place and Edgecomb, in Lincoln County.

MARYLAND.

ANNAPOLIS.—Anne Arundel County Commissioners will build an iron bridge over the Patapsco River at or near the present wooden structure known as the Sweetser bridge.

BALTIMORE.—The ordinance granting permission to Baltimore & Ohio to build a superstructure over Barre street has been signed by the Mayor.

——The Baltimore & Ohio may build a bridge over its tracks.

BELAIR.—The County Commissioners may build two steel concrete bridges and abutments.

CHESTERTOWN.—Bids may soon be asked by Charles L. Dodd, Clerk, for building an iron bridge in Kent County.

WILLIAMSPORT.—Plans are being made by P. J. Courtenay, of Philadelphia, Pa., for a bridge over the Potomac River, to cost about $75,000.

MASSACHUSETTS.

ATTLEBORO.—Plans for abolishing grade crossings have been completed and the town is ready to proceed with the work. The estimated cost is $800,000.

BOSTON.—Northern avenue bridge over Fort Point channel has been authorized by the Legislature, subject to the approval of the War Department.

——Estimates have been made for the rebuilding of Congress street bridge over Fort Point channel.

——Work practically finished on the Norfolk and Harvard street bridges.

——$40,000 is provided for the city's share of the expense of the reconstruction of bridge over railroad tracks at Norfolk, Harvard, Medway and West Selden streets, Dorchester.

——$32,000 for bridge and tunnel under railroad tracks at Temple street, West Roxbury.

——$5,000 for foot-bridge over N. Y., N. H. & H. R. R. at Sarsfield street.

——$5,000 for foot-bridge over N. Y., N. H. & H. R. R. at Northampton street.

——$120,000 for Brookline street bridge across Charles River at Cottage Farm.

——A new bridge may be built at Federal street over Fort Point channel. Nothing decided.

——The Park Commissioners of Cambridge urge the erection of a new bridge on Boylston street. Arrangements under way to decide on the kind of bridge to be built.

——A bill is to be introduced in the Senate providing for the building of a new bridge, with a draw not less than 55 ft. wide, over the Charles River on Western avenue, to connect Boston and Cambridge, to cost about $50,000 to each city.

——The United States Senate has been petitioned to authorize the Harbor and Land Commission to bulid a bridge over the Reserve channel in Boston, to connect I street with Summer street. William Jackson is City Engineer.

——City Engineer Jackson has plans made and approved by the Cambridge Bridge Commission for a bridge to be built at Brookline street between Cambridge and Brighton, to cost about $120,000.

——The Harbor and Land Commissioners have approved the plans for a new steel bridge across Fort Point avenue from Atlantic avenue to the New England freight yards on the South Boston side. The bridge will have two fixed spans 149 ft. long and a draw span 275 ft. long.

CHICOPEE.—A steel bridge will be built over the Connecticut River, for which $150,000 has been appropriated.

FALL RIVER.—The plans of the joint boards of Somerset and Fall River for the bridge over the Taunton Great River call for a bridge 60 ft. wide, with 44-ft. roadway and sidewalks of 8 ft., with an opening of 70 ft., on seven piers, each 50 ft. wide.

GLOUCESTER.—Plans for the new Western avenue bridge over the Annisquam River are being made. W. L. Webber is City Engineer.

HAVERHILL.—The County Commissioners will build a bridge over the Merrimac River at the junction of River and Washington streets. R. R. Evans is City Engineer.

LAWRENCE.—The Boston & Maine may build a steel bridge over the Annisquam River on its Gloucester branch.

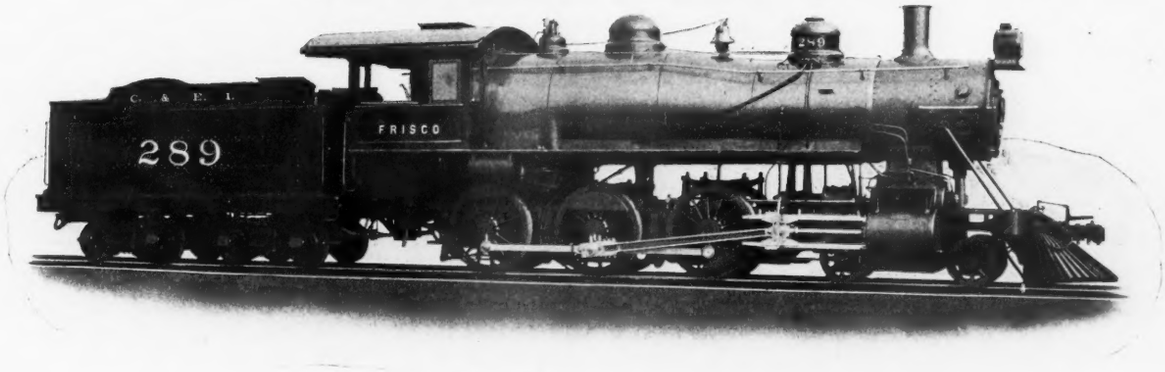
LYNN.—A bill has been signed by the Governor authorizing the Haverhill & Roxford to build a bridge over the Merrimac River.

MILLERS FALLS.—The application of the Northfield & Millers Falls Street Railway Co. for per-

BALDWIN LOCOMOTIVE WORKS

Broad and Narrow Gauge **Locomotives** Single Expansion and Compound

Mine, Furnace and Industrial Locomotives. Electric Locomotives with Westinghouse Motors and Electric Trucks



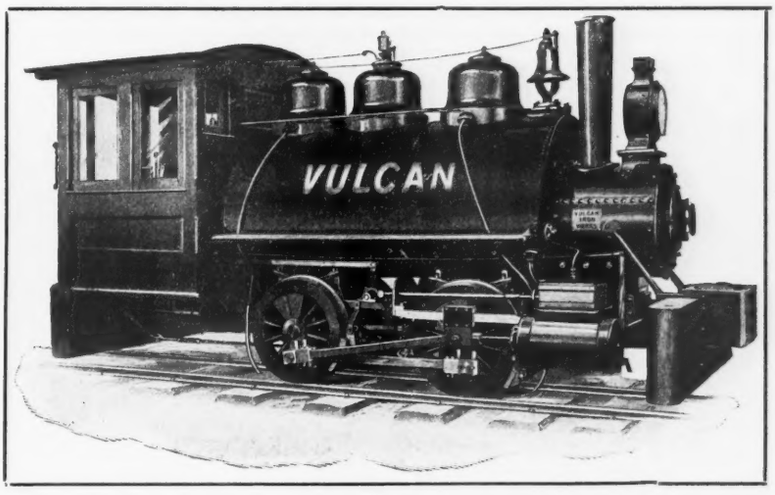
Balanced Compound Locomotive, Built for the Chicago & Eastern Illinois Railroad Co.

Burnham, Williams & Co., Philadelphia, Pa., U. S. A.

Cable Address: "Baldwin" Philadelphia

This is the

Vulcan Contractors' Locomotive



and we build it in all sizes from 6″ x 10″ to 14″ x 20″ cylinders. We can make immediate delivery on certain sizes and prompt delivery on other sizes. We carry a large stock of parts and all orders for repairs are filled promptly. We have been in business here for more than fifty-five years and are likely here to stay. We think we make a good, honest Contractors' Dinkey. We have friends among the contractors who say it is the best on the market.

CIRCULARS, PRICES AND SPECIFICATIONS ON REQUEST.

VULCAN IRON WORKS, WILKESBARRE, PA. U. S. A.

P. S.—WE ALSO BUILD ANY DESIGN OF LOCOMOTIVE UP TO 18″ x 24″ CYLINDERS.

mission to use the bridges entering this place has been refused and the company will have to build its own bridge to enter the town.

NEW BEDFORD.—Representatives of the various towns which are to bear a share of the cost of building the new $1,000,000 bridge over Acushnet River between Fairhaven and New Bedford are estimating the cost which each town will pay.

PITTSFIELD.—Plans are ready for building a new bridge over the Housatonic River at New West street, at a cost of about $7,500, to be built jointly by the city and the Pittsfield Railway Co.

——The Board of Public Works may build an iron bridge over the Boston & Maine tracks at Second street, to cost about $15,000.

SALEM.—At a special meeting of the City Council, it was decided to change the plans for the Jefferson avenue bridge, increasing its cost by about $10,000 over the appropriation of $20,000 already made.

——The County Commissioners have accepted the plans for the new bridge between Salem and Beverly, to cost $100,000.

SPRINGFIELD.—The Boston & Albany may build a steel bridge about 400 ft. long over the Chicopee River on its Athol branch.

——The City Council has under consideration the building of a foot bridge on Old South street to replace the former structure destroyed by fire.

——Plans are reported being made by the Boston & Albany to build a railroad bridge over the Connecticut River, at a cost of about $225,000, to replace the present structure, for which bids will soon be asked.

——A proposition for building the Connecticut River bridge, which is to be about 1,200 ft. long, is now under consideration by a special commission appointed about a year ago. No definite action has been taken upon the matter as yet.

——The Bridge Commission has still under consideration the building of a bridge on the main line of the New York, New Haven & Hartford over Cerus Ruin at the southerly end of the city, to be built in connection with the project to change the railroad to the west side of the Connecticut River. Charles M. Slocum is City Engineer.

WATERTOWN.—Bids will probably be asked in July for building a concrete and steel bridge, to cost $50,000. W. F. Learned is Town Engineer.

WORCESTER.—A bill has been introduced in the State Legislature directing the County Commissioners to build a bridge over Lake Quinsigamond, to cost about $125,000.

MICHIGAN.

——A bill has been passed by both Houses of Congress authorizing the Board of Supervisors of Berrien County to build a bridge over the St. Joseph River, near its mouth, in Berrien County.

ALLEGAN.—Residents have voted to raise $9,000 for building a steel bridge over the Kalamazoo River.

ALPENA.—A concrete bridge is proposed over the Thunder Bay River near this city, to cost about $12,000; also a steel bridge over the same river in Green township.

BATTLE CREEK.—The Common Council has been petitioned by residents to build a bridge over the Kalamazoo River on Barney street.

——The City Council may build two cement arches, one at Jefferson avenue and the other at Monroe street, to cost about $12,000.

BENTON HARBOR.—The Board of Supervisors has decided to rebuild, jointly with St. Joseph township, the Napier bridge, at a cost of about $22,000.

DETROIT.—Reports state that the New York Central will either build a tunnel or bridge the Detroit River at this place. Under either plan, the cost of the work would be in the neighborhood of $10,000,000.

——The Grand Trunk, it is reported, will carry out its plan of building a bridge over the Detroit River between Windsor and this place.

GRAND RAPIDS.—The Board of Public Works is considering estimates prepared by City Engineer Anderson for building the Ann street Bridge.

——The City Council has decided to locate the proposed new Melan concrete bridge at Second avenue. Plans are being made by the City Engineer.

GROSSE POINTE.—Residents have voted to issue $17,000 of bonds for repairing bridges over Fox and Connors creeks.

KALAMAZOO.—The City Council recommends the building of a steel bridge at Gulf street.

LANSING.—A bill has been passed authorizing a bridge over the Grand River at Ada.

——The bill authorizing the township of Ionia to bond itself for $10,000 for a bridge over the Grand River has been passed.

MANISTEE.—The Board of Supervisors has turned over to the county the building of the swing or roller lift bridge over the Manistee river, for which $30,000 of bonds authorized at a recent election will be issued. The bridge is to be completed by June 1 next.

——Bids are wanted March 30, by C. A. Gnewuch, City Clerk, for removing the present drawbridge over the Manistee River at Maple street and building a new drawbridge, approaches, etc.

MT. CLEMENS.—A new bridge, to be built jointly by Clinton and Erie townships over the Clinton river at South Gratiot is proposed, to cost about $25,000.

MUIR.—The question of building a new bridge over Maple River is being considered.

MUSKEGON.—Muskegon and Newaygo counties are seeking permission from the State Legislature to raise funds for building a bridge over the Muskegon River at Bridgeton, to connect these counties.

SAGINAW.—A committee has been appointed by residents to secure the building of a free bridge over the Tittabawassee River at State street, to cost between $10,000 and $15,000.

TRAVERSE CITY.—This city will issue bonds for $9,000 to build a steel and concrete bridge on West Front street.

MINNESOTA.

——Both Houses of Congress have passed a bill authorizing the Minneapolis, St. Paul & Sault Ste. Marie to build a bridge over the Red River of the North from Marshall County, Minn., to Walsh County, N. Dak., the usual provision as to the approval of the plans by the Secretary of War being included.

DULUTH.—Two railroad bridges are proposed to be built over the St. Louis River, one above the old St. Louis & Duluth structure and the other below it.

ELK RIVER.—Bids are wanted at the office of the Village Recorder for building a steel bridge, and steel approaches, with a roadway of 18 ft., over the Mississippi River between this place and the town of Otsego; also for the substructure. A. H. Nickerson is President of the Village Council.

FARIBAULT.—The Chicago Great Western may soon build a bridge over its tracks at Eighth street.

MINNEAPOLIS.—The Minneapolis, St. Paul & Sault Ste. Marie will replace its bridge destroyed by fire with a steel structure.

——The Great Northern and Minneapolis & St. Louis railroads will rebuild the Holden street and Western avenue bridges.

——Bids have recently been asked for bonds to the amount of $215,000 to build Thirty-second avenue n. bridge over Mississippi River, and widen Washington avenue s. bridge over the river, $140,000 for the former and $75,000 for the latter.

——A concrete arch will be built over Minnehaha Creek this summer. K. Ousted is Bridge Engineer.

——The Minneapolis, St. Paul & Sault Ste. Marie is negotiating with the County Commissioner for permission to build a new steel bridge over its tracks at Rice street.

——A bridge is proposed over the Northern Pacific tracks at Harvard street.

——The United States Senate on January 4 passed a bill authorizing the city of Minneapolis to build a bridge over the Mississippi River, the plans to be approved by the Secretary of War.

——Plans have been submitted to the City Council for a concrete bridge over the St. Croix, for which bids will soon be asked.

NORTHLAND.—The Minneapolis, St. Paul & Sault Ste. Marie will build a bridge during the coming summer over Red River north of this place, to be 1,300 ft. long, with a draw of 240 ft.

ST. PAUL.—The high bridge over the Mississippi River, recently destroyed, will, it is reported, be rebuilt, at a cost of about $60,000. L. W. Rundlett is City Engineer.

——A resolution has been passed by the Assembly authorizing the asking of bids for a new bridge at Payne avenue and Beaumont street.

ST. VINCENT.—The Northern Pacific is planning to build a bridge over the Red River between this place and Pembina.

THIEF RIVER FALLS.—Both Houses of Congress have passed the bill authorizing the Minneapolis, St. Paul & Sault Ste. Marie to build a railroad bridge over Red Lake River, at Thief River Falls, the plans and construction of the bridge to be subject to the approval of the Chief of Engineers, United States Army, and the Secretary of War.

WARREN.—The Minneapolis, St. Paul & Sault Ste. Marie may soon ask bids for putting up a steel bridge about 350 ft. long over the Red River 17 miles west of this place.

——The Minneapolis, St. Paul & Sault Ste. Marie will build two bridges over the Snake River near this place during the coming summer.

MISSISSIPPI.

——A bill has been introduced in the Lower House of Congress authorizing Itawamba County to build a bridge over the Tombigbee River.

——Both Houses of Congress have passed the bill authorizing Quitman County to build two bridges over Coldwater River and one over the Tallahatchie River.

——The United States Senate, on February 1, passed the bill authorizing W. Denny & Co. to build a bridge over Dog River, in Mississippi.

——A bill was passed March 2 in the United States Senate authorizing a bridge over the Tombigbee River, in Lowndes County.

——A bill authorizing Sunflower County, Miss., to build a bridge over the Sunflower River was passed by both Houses of Congress, the plans having been already approved by the Secretary of War.

FULTON.—On January 9 the United States Senate passed a bill authorizing the County of Itawamba, Miss., to build a bridge over the Tombigbee River, near Fulton.

HATTIESBURG.—The Board of Supervisors is having plans made for a steel bridge to be built over Tallahala Creek.

MOSS POINT.—Permission has been granted to Denny & Co., of this place, to build a bridge over the Escatauba River.

NATCHEZ.—An iron bridge will be built over the creek at this place. John F. Jenkins is Clerk of the Board of Supervisors.

SMITH'S FERRY.—The United States Senate, on January 31, passed the bill authorizing the Pearl & Leaf Rivers Railroad Co. to build a bridge across the Pearl River at or near Smith's Ferry, the plans to be approved by the Secretary of War and the bridge is to be used by all railroads desiring such use.

MISSOURI.

——Both Houses of Congress have passed the bill authorizing the Paragould & Memphis Railroad to build a bridge across the St. Francis River in Missouri.

GLASGOW.—A bill has been passed by the Lower House of Congress authorizing the Missouri Central to build a bridge over the Missouri River at this place, to connect Howard and Saline counties.

HANNIBAL.—A bridge is proposed to be built over the Mississippi River for the use of the new electric road to be built between this place and Quincy.

JEFFERSON.—A concrete arch 40 ft. wide and 20 ft. long is to be built here. Plans are also being made for a concrete arch 100 ft. wide and 25 ft. long. J. C. Herring is City Engineer.

JOPLIN.—The Kansas City Southern, it is reported, will at once begin work on a viaduct over its tracks at North Main street.

KANSAS CITY.—The Senate Committee on Commerce has favorably reported on the bill authorizing the Kansas City, Liberty & Excelsior Springs Railroad to build a bridge over the Missouri River between Clay and Jackson counties.

——The Kansas City, Mexico & Orient will build a trestle 308 ft. long over Walnut River, one of the same length over Duranchon Creek and one 224 ft. long over the second crossing of Walnut River, on the line of its extension between Eldorado and Matfield Green, in Butler and Chase counties, Kan.

——City Engineer A. Harper tells us that this city has an agreement pending in council whereby, in consideration of the vacation of certain streets and alleys, the Belt Line Railway will build four bridges over its tracks at the following street crossings: Kansas avenue, Olive street, Montgall avenue, and steel approaches and viaducts at Broadway.

——The City Council, reports say, has appropriated $15,000 to build a steel viaduct over the Belt Line tracks on Kansas avenue.

——The Upper House of the Council has granted a franchise to the Kansas City Viaduct & Terminal Co. to build a steel toll viaduct 62 ft. wide to carry two tracks, from Sixth street to a point on Ferree street, in Kansas City, Kan. The proposed viaduct will cost, it is estimated, $2,000,000.

——The city has agreed to build an overhead viaduct and steel approaches at Lydia avenue which will cost about $200,000. The Missouri Pacific, Chicago & Alton and the Metropolitan Street Railway Co. will pay a part of the cost.

——Permission has been given to the Metropolitan Street Railway to build a viaduct to James street, paralleling the old structure, at a cost of about $75,000.

——The pile bridges of the Kansas City Belt Line and the Rock Island have been destroyed by floating ice in the Kaw River and may be replaced by steel structures.

LEXINGTON.—Both Houses of Congress have passed a bill extending the time for beginning the construction of a bridge over the Missouri River at this place, previously approved April 28, 1904.

——Both Houses of Congress have passed the bill authorizing a combined wagon and electric railroad bridge over the Missouri River at this place.

PARKVILLE.—A bill extending the time for the completion of the bridge over the Missouri River at Parkville has been passed by both Houses of Congress.

RANDOLPH.—A bill has been passed by the Senate authorizing the building of a combined highway and electric railroad bridge over the Missouri River.

ST. CHARLES.—A bill has been passed by the Lower House of Congress authorizing the Missouri Central to build a bridge over the Missouri River to connect St. Louis and St. Charles counties.

ST. JOSEPH.—The City Council has under consideration the question of building a bridge at the foot of State street.

ST. LOUIS.—The Board of Public Improvements has decided to build a concrete arch with a 24-ft. roadway and foot paths on each side over the River des Peres in Forest Park, to replace the present wooden structure.

——A contract has been given by the St. Louis Southwestern to the Missouri Valley Bridge Co. for building the piers of the new bridge to be built over the Red River a mile below this city. Bids will soon be asked for the superstructure.

——The Council has passed a bill for building a concrete arch bridge on the Clayton road in Forest Park, to cost $12,000.

——Condemnation proceedings for a side street along Chouteau avenue have been begun, this being the first step toward building a viaduct over the Missouri Pacific tracks on Chouteau avenue west of Grand avenue. Estimated cost of viaduct, $250,000, not including land damages.

——Plans for Sarah street viaduct have been approved by the Board of Public Improvements. The viaduct is to cost $200,000, not including land damages.

——A partial reconstruction of the Eighteenth street viaduct is also contemplated. Carl Gayler is Bridge Engineer.

WARRENTON.—Bids are wanted April 6 by A. W. Wehmeyer for building a steel bridge 124 ft. long over Charrette Creek.

MONTANA.

ANACONDA.—The Northern Pacific is reported making plans for building a stone viaduct over Harrison avenue to carry five tracks.

BILLINGS.—A steel highway bridge is proposed to be built over the Yellowstone River near Junction. J. F. Fish is County Clerk.

NEBRASKA.

——Bids are about being asked by John Graf.

THE SUN NEVER SETS
On Hartley & Teeter Light Inspection Cars

AMONG THE FOREIGN LANDS IN WHICH THESE MACHINES ARE USED ARE THE FOLLOWING:

ALASKA, CANADA, MEXICO, COSTA RICA, CUBA, COLUMBIA, VENEZUELA, BRITISH GUIANA, ECUADOR, BRAZIL, THE SCANDINAVIAN PENINSULA, HOLLAND, FRANCE, SPAIN, SWITZERLAND, ITALY, GERMANY, AUSTRO-HUNGARY, ROUMANIA, RUSSIA, TURKEY, EGYPT, TUNIS, ALGERIA, THE GOLD COAST, UGANDA, CAPE OF GOOD HOPE, INDIA, SIBERIA, CHINA, JAPAN, JAVA, BORNEO, AUSTRALIA, NEW ZEALAND, AND FIJI ISLANDS.

THE GOLD MEDAL

HAS BEEN AWARDED THESE CARS BY THE SUPERIOR JURY OF AWARDS AT THE WORLD'S FAIR AT ST. LOUIS, MO., THUS DECLARING THEM TO BE THE HIGHEST TYPE OF LIGHT CARS, AND THEY STAND WITHOUT AN EQUAL.

Write us for catalogue.

LIGHT INSPECTION CAR CO.
HAGERSTOWN, INDIANA, U. S. A.

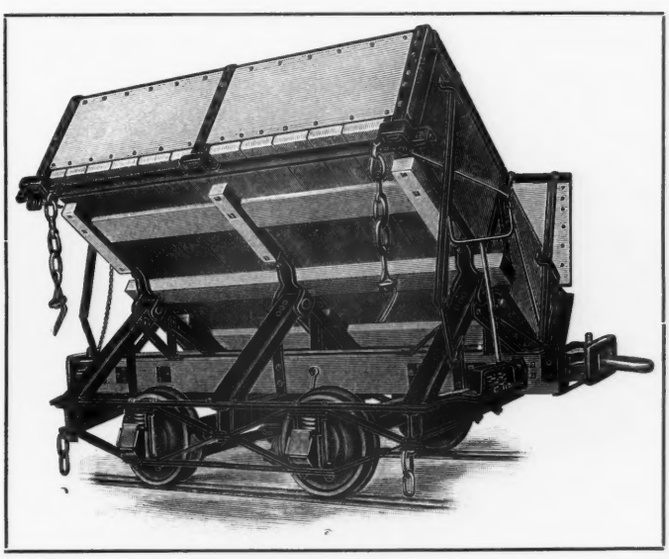
SOUTHWESTERN AGENTS
MESSRS. HANDLAN-BUCK MFG. CO.
ST. LOUIS, MO.

The Kilbourne & Jacobs Mfg. Co.
COLUMBUS, OHIO, U. S. A.

LARGEST MANUFACTURERS IN THE COUNTRY OF

Contractors' Two-Way Dump Cars. 1½ yard capacity for 36 in. gauge track; three-yard capacity for 36 in. gauge track; six-yard capacity for standard gauge track.

Hopper or Bottom Dump Cars. Six-yard capacity for standard track.



ALSO EXCLUSIVE MANUFACTURERS OF

- "Boss" Solid Steel Drag Scrapers.
- "Columbus" Solid Steel Drag Scrapers.
- "K. & J." Square Box Wheel Scrapers.
- "K. & J." Pressed Bowl Wheel Scrapers.
- Contractors' Plows.
- Dump Carts.
- Contractors' Wooden Barrows.
- Steel Tray Barrows.
- Tubular Barrows.
- Wood and Steel Cars of all kinds.
- Trucks of every description.

WRITE TO US FOR CATALOGUE AND PRICES.

THE KILBOURNE & JACOBS MFG. CO.

County Clerk, for building all the bridges that may be needed in Platte County for one year.

ALMA.—Bids are wanted April 4 by the Board of Supervisors for building steel bridges in Harlan County. W. F. Stevens is County Clerk.

CENTRAL CITY.—Bids are wanted March 21, by C. F. Newmyer, County Clerk, for building all the bridges in Merrick County for one year.

COTESFIELD.—A vote has been passed to issue bonds for building a bridge over the North Loup River.

NEBRASKA CITY.—The County Commissioners, reports say, have decided to build three steel bridges, one near Talmage, one near Douglas and the other near Berlin, in Otoe County.

NORTH PLATTE.—Bids, it is reported, are wanted by the Board of County Commissioners for putting up a highway bridge 3,200 ft. long and 16 ft. wide over North Platte River. F. R. Ginn is County Clerk.

NEW HAMPSHIRE.

RAYMOND.—A bridge of the Boston & Maine between this place and Epping, recently destroyed by fire, may be rebuilt.

NEW JERSEY.

AMBOY.—The Central of New Jersey is reported to be planning to put up a bridge over the Raritan River between Perth Amboy and South Amboy west of the present railroad bridge, to cost between $500,000 and $1,000,000.

CAMDEN.—The Pennsylvania will build eight bridges in connection with its track elevation.

HOBOKEN.—The road committee of the Board of Freeholders has agreed upon the preliminary plans for the viaduct to connect Hoboken with Jersey City Heights, which is proposed to be built in the form of a W, to have three termini on the hill. Each leg is to have double electric railroad tracks and sidewalks.

JERSEY CITY.—The Central Railroad of New Jersey has petitioned for permission to put up a bridge over its tracks at Communipaw avenue.

NEWARK.—The Essex County Park Commissioners have decided to ask bids for a steel bridge over the Lehigh Valley tracks from the Upper Elizabeth road, to cost about $15,000.

PASSAIC.—The Bergen County Freeholders have closed the temporary bridge over the Passaic River. A proposition was received from the Public Service Corporation offering to pay $10,000 toward building a new bridge if permitted to place two tracks on it.

TRENTON.—The Board of Freeholders has decided to appoint a committee to arrange for bids for building the railroad bridge at Chamber street. Frank Eppelle is County Engineer.

WASHINGTON'S CROSSING.—Ice in the Upper Delaware River has carried away two-thirds of the new bridge at this place, nine miles above Trenton. Of the new bridges being built between this place and Port Jervis to restore the crossings destroyed last March, when floods carried away all bridges, this was the nearest completion.

NEW MEXICO.

SANTA FE.—Bids may soon be asked by the Chairman of the Board of County Commissioners for building a three-arch stone bridge over the Santa Fe River. J. L. Zimmerman is County and City Engineer.

NEW YORK.

BINGHAMTON.—A viaduct is proposed to be built in this city, to cost about $1,000,000.

——The Delaware, Lackawanna & Western is planning to put up a new steel bridge 930 ft. long, to cost about $150,000, over the Shenango River, early this spring, to replace the present structure.

——The Delaware, Lackawanna & Western is reported making surveys to locate the site for a bridge to be built over the Susquehanna River.

BROADALBIN.—The town board has decided to build a stone bridge to replace the present structure at Hooseville.

BROOKLYN.—Plans for the elimination of grade crossings on the Brighton Beach road at Park place and Prospect place have been submitted to the City Commissioner of Works for his approval. The improvements include an elevated structure about 1,000 ft. long, to cost $102,000.

BUFFALO.—A viaduct is to be built by the Erie over its tracks at Perry street.

——A bill has been passed by the Assembly which provides that the citizens of Erie County may vote to bond themselves for $100,000, and that Erie County and the town of Grand Island may build a steel railroad bridge over Niagara Falls to Grand Island, the estimated cost of which is placed at $1,500,000. Charles D. Marshall, of Buffalo, is interested, and George C. Diehl is County Engineer.

——The Aldermen have refused to accept the report of the Aldermanic Committee on Bridges, which voted to readvertise for new bids for the proposed bridge to be built over the Buffalo River at Ohio street, and have asked for a second report.

——Press reports state that the Delaware, Lackawanna & Western, the Lake Shore & Michigan Southern and the New York, Chicago & St. Louis have agreed to jointly make extensive improvements, which will include the elevation of a long stretch of track and the building of a viaduct.

——The Committee on Wharves and Harbors has been asked to make a report on the question of removing the railroad bridges over the Buffalo River, the United States authorities having begun action to compel their removal.

CARMEL.—An iron and stone bridge 75 ft. long is proposed to be built over railroad tracks.

ELMIRA.—Plans, it is reported, are being made by the City Engineer for building the Lake street bridge.

——Bids may soon be asked by the Mayor for building a steel bridge 300 ft. long over the Chemung River, to cost $55,000. E. D. Burgen is Deputy Clerk.

ENDICOTT.—The Erie may build a steel viaduct with concrete piers 186 ft. long, to consist of three spans, one of 126 ft. and two of 30 ft., over its tracks.

FRANKFORT.—The Utica & Mohawk Valley Railway may build a bridge over the Erie Canal at this place. M. W. Martin, Chief Engineer, Utica.

GOUVERNEUR.—This city is planning to put up a steel plate girder bridge over the Oswegatchie River at Main street, to cost about $18,000.

JAMESTOWN.—An arrangement has been made by the Chautauqua Traction Co. and the Pennsylvania to jointly build an overhead crossing at Valley street, in Mayville, to cost about $25,000.

LYONS FALLS.—The State Legislature will be petitioned to appropriate $30,000 for building an iron bridge over the junction of the Black and Moose rivers.

MT. MORRIS.—It was voted to bond the town for $10,000 to build two iron bridges, one over the Genesee River between this place and Castile, and the other over the Kiskequa Creek at Tuscarora.

NEWFANE.—The town directors have decided to build an iron bridge 400 ft. long over Eighteen-Mile Creek at Burt, to cost about $15,000.

NEW YORK.—Plans have been made by Commissioner Best for lengthening the train platforms of the Brooklyn Bridge, extending the present train shed over Park row and adding two new platforms, each 340 ft. long, at a cost of about $300,000.

——The United States Senate, on April 26, passed the bill authorizing the Spuyten Duyvil & Port Morris Railroad (New York Central) to build a bridge over Spuyten Duyvil Creek and the Harlem River north of the Harlem River pier.

——The Board of Estimate, on August 16, appropriated $10,000 for surveys and preliminary work for the proposed Hudson Memorial bridge to be built over Spuyten Duyvil Creek, connecting Inwood Heights, Manhattan, with Spuyten Duyvil Heights, in the Bronx. It is intended to have the bridge completed for the celebration in September, 1909, of the 300th anniversary of the discovery of the Hudson River.

——The Board of Estimate has approved the following appropriations: $2,500,000 for the Commissioner of Bridges to pay for land taken for the Williamsburg bridge, and $600,000 for land for the Blackwell's Island bridge; also $200,000 for building street bridges over the railroad tracks in the Bronx.

——The Manhattan bridge to cross the East River, from the Bowery and Canal street, Manhattan, to about Fulton and Gold streets, Brooklyn, will be a suspension bridge 1,470 ft. long between towers, with a clear height at the center above high water of 110 ft. The two anchorage spans will each be about 725 ft. long, Total length of main structure, 2,920 ft.; total length, including approaches, about 9,900 ft. The Municipal Art Commission has agreed to the use of wire cables in the construction of the bridge, and it is said that Bridge Commissioner Best will ask for bids about May 1, for the superstructure, the tower piers having been already completed. Contracts have been let for the anchorages.

——On the report of the Finance Committee, the Board of Aldermen has authorized Bridge Commissioner Best to make changes in the accepted plans of the Blackwell's Island bridge, which will provide for six instead of four tracks, and will increase the strength of the iron road trusses, at an additional cost of $360,000. The Pennsylvania Steel Co. has the contract for building the bridge.

——An ordinance is before the Board of Aldermen to authorize the New York Connecting Railroad to build a viaduct through Long Island City and a bridge from that place over the East River, Ward and Randall's Islands, to a point in Westchester County, N. Y.

NIAGARA FALLS.—The Pere Marquette may build a bridge over the Niagara River at a point known as Swift Drift.

ONEIDA.—The Common Council has authorized the Mayor to present a petition to the State Board of Railroad Commissioners asking for the elimination of grade crossings at Seneca avenue by the construction of a viaduct over the New York, Ontario & Western tracks and Oneida Creek.

——Bridge bonds for $36,000 are reported sold.

POUGHKEEPSIE.—Engineers of the New York, New Haven & Hartford, the new owners of the Poughkeepsie bridge, it is reported, will make repairs to the structure, at a cost of about $200,000.

RENSSELAER.—A bill has been introduced in the Legislature authorizing an appropriation of $21,000 for the proposed bridge over the railroad tracks on Third avenue.

ROCHESTER.—Plans recently completed by City Engineer McClintock for the Genesee River bridge in Seneca Park call for a double-deck concrete structure with a span of 500 ft. and roadway 175 ft. above the river.

——The New York Central has been authorized by the Common Council to replace its wooden bridges over Moore, Orchard and Magne streets with steel structures.

SCHENECTADY.—The question of building a viaduct over Cotton Factory Hollow, to cost about $20,000, is being considered by the committee.

SYRACUSE.—The New York Central, according to local reports, will spend $100,000 for new bridges at this place, including one over the Central and Lackawanna tracks at Syracuse Junction and one over the Oswego Canal between North Selina and Willow stretes.

——The Rochester, Syracuse & Eastern has plans ready for building a bridge with concrete abutments and steel arches 1,400 ft. long over the Montezuma swamps, to cost about $125,000; also to build a similar bridge 700 ft. long in Brighton, on which work will probably be begun next year.

TOWNERS.—The New York, New Haven & Hartford, in connection with its double-tracking of the Highland Division, will replace the 1,500-ft. wooden trestle over the valley (on the Harlem Division of the New York Central) with a steel structure 185 ft. long, and the balance will be filled in.

UTICA.—Plans are under consideration for a bridge over the tracks at the foot of Genesee street and over the canal, railroad and river at the foot of Mohawk street.

——This city and Marcy are to build a bridge over the Mohawk River at Schuyler street, to cost $700,000.

——A bridge is proposed to be built by the West Shore over Bleecker street, to cost about $65,000.

VESTAL.—Petitions for a highway bridge over the Susquehanna River have been made by residents of the towns of Vestal and Union. The cost will be about $40,000.

WATERLOO.—The Board of Supervisors has passed a resolution to petition the Legislature for a new bridge over Seneca River, to replace the free bridge now maintained by Seneca and Cayuga counties.

WATERTOWN.—Henry E. Baker, City Engineer, is reported estimating the probable cost of viaduct bridge, about 850 ft. long and 50 ft. wide. The matter has been under consideration for some time but no definite decision has been reached.

NORTH CAROLINA.

CHARLOTTE.—At a joint meeting of the Board of County Commissioners and High Commission, it was decided to build steel bridges over many of the large streams in Mecklenburg County.

GOLDSBORO.—The Howland Improvement Co., which now leases the Atlantic & North Carolina railroad, reports, say, will build a steel bridge over Stony Creek near this place; also one over the stream near Newbern to replace the present structures.

KINSTON.—The Kinston & Carolina Railroad, reports say, will build an iron bridge on its road, 300 ft. long, with a steel draw.

LEXINGTON.—A railroad bridge may be built at this place. J. A. Mills, of Raleigh, can give information.

NORTH DAKOTA.

LANGDON.—Bids are wanted April 5, by Robert Work, County Auditor, for building a steel bridge at Wahalla in Cavalier County.

VALLEY CITY.—Bids are being asked by T. M. Gunderson, County Auditor, for building two steel bridges over the Cheyenne River at Kathryn, seven miles from this place.

OHIO.

AKRON.—A viaduct is to be built at East Exchange street to abolish grade crossings. J. W. Payne is City Engineer.

——The Baltimore & Ohio, according to reports, will repair many of its bridges on its Cleveland Terminal & Valley Division, at a cost of about $115,000.

——Plans are reported ready for building the North Hill viaduct, which is to be 2,700 ft. long, with 27-ft. roadway and 5-ft. sidewalks, the cost, $215,000, to be jointly borne by the Northern Ohio Traction & Light Co. and the city.

——The County Commissioners, in connection with the Northern Ohio Traction & Light Co., it is said, will jointly build a combined highway and street railroad bridge over the tracks of the Baltimore & Ohio, to cost about $30,000

——The Baltimore & Ohio, it is reported, will build a high level bridge over the Little Cuyahoga River.

ASHTABULA.—Bonds to the amount of $200,000 have been authorized by the County Commissioners for building the bridge at Ashtabula Harbor. Lewis A. Amsden is City Engineer.

CARTHAGE.—Plans have been completed by City Engineer C. E. Perkins for building a viaduct to replace the structure recently destroyed.

CINCINNATI.—The Pennsylvania is reported to be taking soundings to locate the site for a new bridge over the Ohio River at the east end of the city.

——Repairs will soon be made to the Central bridge between this place and Newport over the Ohio River, at a cost of about $100,000. Address Col. R. W. Nelson, care Cleveland Trust Co.

——The Cincinnati, Georgetown & Portsmouth will spend between $15,000 and $20,000 for bridges on the line of its road during this year.

——County Engineer Frank Krugg is reported making plans for an electrical lift bridge over the canal at Benton street, Lockland, to cost $24,814.

——The City Council, at a recent meeting, adopted plans for the Harrison avenue viaduct, to extend from Harrison avenue and Bernard street over the Baltimore & Ohio Southwestern, the Cleveland, Cincinnati, Chicago & St. Louis, and the Cincinnati, Hamilton & Dayton tracks and Mill Creek to State avenue near Ernst street, to cost about $275,000.

——The Chesapeake & Ohio will build a steel viaduct, in connection with its track elevation, about three-quarters of a mile long, to connect with the Cincinnati, Hamilton & Dayton.

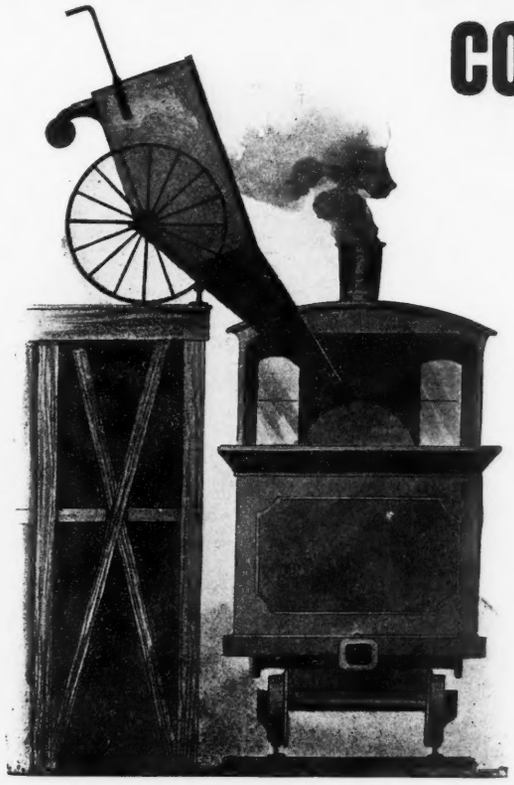
——The Cincinnati, New Orleans & Texas Pacific is planning to spend about $800,000 for steel bridges, to include one of 1,000 ft. over South Fork, one over Flushing Creek 510 ft. long, a viaduct over the Cumberland River of 800 ft., and a viaduct at New River with a combined length of 1,300 ft.

——Bids will be received this spring for building two bridges. W. J. Springborn is Director of the Board of Public Service.

——At a recent meeting of the Council, it was decided to have the City Engineer make plans and estimate the cost of repairing the Liberty street viaduct.

——Bids will soon be asked for building two double-track steel bridges on the Cincinnati Southern road between Cincinnati and Erlanger.

ALL STEEL CHARGING BARROWS FOR COALING LOCOMOTIVES



Five Repeat Orders

One Leading Railway has Recently Purchased

91

We make a complete line of Steel Wheel Barrows for all purposes, Coal and Ore Cars, Dump Cars, Oil-bearing Car Wheels, Steel Trays, Trucks, etc.

The BEST in the WORLD

Write for new Catalog, illustrating and describing our goods and learn WHY they are better than those you are now using. Trial orders make regular customers.

Archer Iron Works, 36 La Salle St. CHICAGO

INSTANTLY AVAILABLE FOR

EMERGENCIES, ACCIDENTS,
INSPECTION, SUPERVISION,
OPERATION

FRICTIONLESS Ball Bearings Throughout

LIGHT—50lbs. STRONG—Trussed Frame
SPEEDY—30 to 40 miles per hour

RED CROSS FOLDING VELOCIPEDES

Patented, Feb. 28, 1905

SHOULD BE ON EVERY TRAIN AND AT ALL STATIONS

This is a wholly unique and carefully perfected device, simple in all its constructional and mechanical characteristics. But remarkable in its efficiency and adapted to all cases where a velocipede has ever been used, and available for many more that heretofore have not been provided for.

E. T. HARRIS

531-545 West Fifteenth Street CHICAGO

Ky., to cost $200,000 and $125,000, respectively.

——Plans are being made for an elevated structure to be built from Eighth street to Third and Front streets for the entrance to the new terminals of the Cincinnati Southern.

CLEVELAND.—The Erie is making plans to build a 100-ft. single-span steel bridge at Scranton avenue to carry two tracks.

——Bids are wanted March 20 by the Board of Public Service for the superstructure of a steel highway bridge over the New York, Chicago & St. Louis tracks on Detroit street.

——Bids are wanted March 20, by the Board of Public Service, for building the superstructure of a steel highway bridge on Detroit street.

——City officials have under consideration the question of building two bridges. W. J. Springbone is President of the Board of Public Service.

——The Cleveland, Cincinnati Chicago & St. Louis may build a concrete steel bridge carrying six tracks over Clark avenue, and grade separations between the Pennsylvania Co. and the city's streets in the south end, at a cost of $825,000. William J. Carter is City Engineer.

——According to reports, City Engineer William J. Carter is making plans for a high level bridge 115 ft. high over the Cuyahoga River, to cost about $2,000,000.

——The Newburg & South Shore will build a bridge over Harvard street. The plans approved by the Board of Public Service provide for a structure with brick, concrete and rock ballast.

——The question of building a low-level bridge from Clark avenue to East Clark avenue is still being considered. The work will cost $1,000,000. The Board of Control has approved an issue of $300,000 of bonds as part of the cost.

——A bascule bridge will be built over Cuyahoga River at Jefferson street, at a cost of about $125,000.

——The People's Street Railway is considering the question of building a bridge, to cost about $40,000.

——An ordinance authorizing an issue of $75,000 of bonds for a new bridge at Jefferson street has been introduced in the Council.

——A special bill is to be introduced in the Legislature for permission to issue bonds, or raise additional taxes, for bridge purposes. There are about 40 condemned county bridges, which will require over $108,000 to rebuild.

——The Cuyahoga County Commissioners have authorized the building of about 24 bridges, to cost $70,000.

COLUMBUS.—Plans, it is reported, are being made by County Engineer Walter B. Raun for a two-span bridge, to cost about $90,000.

——An ordinance has been passed by the City Council authorizing the Board of Public Service to pay $63,000 toward building the Fishinger Mill bridge, the balance to be paid by Franklin County. George D. Jones is President of the City Council.

——The County Commissioners, it is reported, will build a viaduct over the Pennsylvania tracks at Reed avenue.

——Bids, it is reported, are wanted March 30, by L. E. Jones, County Auditor of Franklin County, for building the substructure and superstructure of a county bridge over Mason Run.

——The bridges destroyed by floods in Franklin County include three large bridges over the Big Walnut, at Georgesville; also over the Black Lick, on Winchester Dyke, the canal bridge at Lockburn, and others. It will cost about $100,000 to replace them.

——Separate bids are wanted March 30 for building a bridge in Truro township, two in Franklin township, three in Madison township, one in Plain township, one in Mifflin township, one in Jefferson township, two in Blendon township and one in Pleasant township. L. E. Jones is Auditor of Franklin County.

DAYTON.—The Board of Public Service has recommended that the Pittsburg, Cincinnati, Chicago & St. Louis be granted permission to rebuild its bridge over the Cooper Hydraulic at Bainbridge street.

——The City Council, at a recent meeting, passed an ordinance to issue $120,000 in bonds, the proceeds to be used for building the new Washington street bridge over the Great Miami River.

——The City Council is considering an ordinance authorizing an expenditure of $200,000 for a bridge over the Miami River at Germantown street, one-third of the cost to be borne by the People's Railroad Co. and the balance by the city.

ELYRIA.—Petition has been made to the County Commissioners to build a bridge over Black River in Sheffield township, at a cost of about $200,000, to replace the present structure.

FINDLAY.—Bonds for $50,000 for building and repairing bridges are reported to have been voted by Hancock County.

——Plans have been completed by Engineer Reigle for a number of steel viaducts on the line of the Lima, Findlay & Toledo Electric Railway over the tracks of the Cincinnati, Hamilton & Dayton.

GRAFTON.—Plans are being made by the Cleveland, Cincinnati, Chicago & St. Louis for building a double-track bridge this spring over the Black River, to cost about $40,000, to be a single-span structure with concrete abutments and steel superstructure.

GREENVILLE.—The County Commissioner is considering the question of building a bridge on Broadway over Greenville Creek, to cost about $12,000.

IRONTON.—The Cincinnati, Hamilton & Dayton is planning to build a railroad bridge over the Ohio River, to cost about $1,000,000.

LARUE.—The Cleveland, Cincinnati, Chicago & St. Louis has decided to build a new bridge over the Scioto River to replace the present steel 100-ft. structure.

MARIETTA.—The Marietta, Columbus & Cleveland Railroad will rebuild a four-span Howe truss bridge over the Little Hocking River. Total length, 504 ft. For plans and specifications, address D. I. Roberts, President, Marietta, Ohio.

MIDDLETOWN.—Residents are petitioning the County Commissioners to build a new bridge over the Miami River at West Sixth street.

PORT CLINTON.—The County Commissioners will build a steel bridge 225 ft. long, with a 16-ft. roadway, over Portage River, in Harris township. Henry Pafenbach is County Auditor.

PORTSMOUTH.—Plans have been completed by Engineer Pratt, and will be submitted to the County Commissioners in Sylvania and Washington townships. D. F. Davies, Jr., is County Auditor.

PORTSMOUTH JUNCTION.—The Norfolk & Western is considering the question of rebuilding the present bridge over the Scioto River at this place.

——A number of bridges will be built by Lucas Council, for building a stone culvert over Lawson's run, to cost about $18,000.

——Bids will soon be asked by the Portsmouth Street Railway & Light Co. for building a bridge over its tracks on Tenth street, to cost about $12,000.

READING.—The County Commissioners will replace the oldest bridge in Berks County, the old two-stone arch at Douglassville, in Amity township, built in 1797, with a new iron bridge.

SALEM.—The Salem & Eastern Railway will build a bridge 110 ft. long over the Pennsylvania tracks, also a trestle about 800 ft. long.

SANDUSKY.—The Lake Shore & Michigan Southern, it is reported, will build a new drawbridge.

SPRINGFIELD.—The wooden bridge over the tracks on South Factory street will be replaced by a new structure.

——The Board of Public Service adopted a resolution requesting the City Council to provide funds for building a new bridge over Buck Creek on Water street, to replace the former structure.

——The Board of Public Surveys will build a concrete bridge on Bechtle avenue, to cost about $18,000.

——The Board of Public Service has under consideration the question of building a new bridge at the intersection of Sherman avenue and Nelson street, and City Engineer Sieverling has been instructed to estimate the cost.

STEUBENVILLE.—A bridge is proposed over the Ohio River, to cost about $80,000.

TIPTON.—The County Commissioners have under consideration the question of building an iron bridge over the Sandusky River, at a cost of $10,000.

TOLEDO.—The City Council has been petitioned by the Board of Public Service to build a concrete steel bridge to replace the Cherry street bridge. The plans call for a bridge of four spans, each 156 ft. long, with a rolling lift draw of 200 ft., and approaches over the west side in excess of 180 ft., and to be 80 or 85 ft. wide and 30 ft. above the water.

——The Lake Shore will at once build a new bridge over its tracks at Fassett street.

——The Board of County Commissioners has sold $75,000 of bonds, the proceeds to be used for bridge improvements and repairs in Lucas County.

——The Lake Shore and the city may jointly build a bridge over the railroad tracks at Oak street.

WILLOUGHBY.—The Lake Shore & Michigan Southern, it is reported, will build a concrete arch 153 ft. long and 55 ft. wide over the stream here.

YOUNGSTOWN.—Petition has been made for an overhead bridge at the foot of Elm street.

——Plans are reported being made by the City Engineer for an overhead bridge at Ardale street.

——The Pittsburg & Lake Erie, it is said, will at once build a steel bridge 878 ft. long over its tracks in East Youngstown.

——A viaduct is proposed to be 1,500 ft. long to replace the present Credit Mobelier bridge, to cost about $110,000.

——Residents of this place are agitating the question of putting up three bridges; one at Elm street, one at Belmont avenue and the other on the east side of Wick avenue. The Belmont avenue bridge is to be 725 ft. long, including approaches, which will be 95 ft. wide at the Federal street end.

——A bridge is proposed to be built from Federal street to Bellmont avenue.

OKLAHOMA TERRITORY.

GUTHRIE.—The County Commissioners are having surveys made for building a new bridge 35 ft. wide over the Cimarron River.

——Plans have been made for building a viaduct over the Santa Fe tracks from Noble avenue, Guthrie, to Sixth street, West Guthrie. The cost of the work will be about $150,000. Work has not been started, as the necessary funds are not available.

——Logan County Commissioners will authorize some bridge work in July.

KINGFISHER.—Fingfisher County may build about 18 new bridges.

NEWKIRK.—About 12 steel bridges are to be built in Kay County. H. B. Davis is Deputy County Clerk.

OKLAHOMA CITY.—Plans are being made by City Engineer Burke for stone or steel approaches to the Choctaw viaduct on Walnut street, to cost about $15,000.

PAWNEE.—Bids are being asked by C. R. Adams, County Clerk, for building two bridges over the Cimeron River in Pawnee County.

WEATHERFORD.—The Colorado, Oklahoma & Southeastern will build a trestle 3,000 ft. long over the South Canadian River on the line of its proposed road between this place and Woodward, at a point near Putnam.

OREGON.

——A bill was introduced in the U. S. Senate on February 20 authorizing the Portland, Nehalem & Tillamook Ry. Co. to build a bridge over the lower Willimette River in Oregon above Elk Rock.

PENDLETON.—Plans are being made to build a bridge 18 ft. wide, with a central span of 120 ft. and approaches of 50 ft., over the Nolin River.

PORTLAND.—Plans are being made for rebuilding the bridge on Grand avenue; also for the one on Williams avenue.

——Three new steel bridges will be built during the present year by Wheeler County officials.

——The steel bridge over Union avenue is to have a total length of 420 ft., to consist of two Warren trusses, each 120 ft., and plate girders, to cost $55,000; and the one at Grand avenue, a total length of 360 ft., to consist of one Warren truss of 150 ft. and plate girders, to cost $45,000. W. C. Elliott is City Engineer.

PORT OXFORD.—Bids are wanted April 4, by George Smith, Goldbeach, for building a county bridge over Elk River.

ST. JOHNS.—The Northern Pacific is reported making surveys for building a bridge about 180 ft. above the surface of Willamette River on its new line into this place.

SPRINGFIELD.—The Southern Pacific is planning to build a bridge over the Willamette at this place.

UMATILLA.—A bridge may be built over the Umatilla River near this place.

PENNSYLVANIA.

——Both Houses of Congress have passed the bill authorizing the Leckrone & Little Whiteley Railroad to build a bridge over the Monongahela River in Pennsylvania.

——On March 24, the United States Senate passed the bill, previously passed by the House of Representatives, authorizing the Eastern Railroad to build a bridge over the Monongahela River in Pennsylvania.

ALLENTOWN.—A provisional decree has been issued by the court authorizing the County Commissioners to ask bids for building a steel overhead bridge from Pine street to West Catasauqua over the tracks, canal and river.

ALTOONA.—A steel bridge is proposed to be built over the Pennsylvania tracks at Seventh street early this spring, to consist of one span 168 ft. long, with approaches of 370 ft., to carry two tracks of the City Passenger Railway, the cost to be jointly borne by the city, the Pennsylvania and the City Passenger Railway.

——At a meeting of the Pennsylvania officials and the borough officials of Lilly, it was decided to have County Surveyor Elder prepare plans and estimate the cost of a bridge at this place.

BERWICK.—The Delaware, Lackawanna & Western, reports say, will give $10,000 toward the cost of the proposed overhead bridge at the foot of Market street.

BUENA VISTA.—Allegheny and Westmoreland counties will jointly build a new bridge over the Youghiogheny River, to cost about $75,000.

BUSTLETON.—Plans for two bridges, to be built by the Philadelphia & Reading over Pennypack Creek, have been approved by the Board of City Surveyors. The bridges are on the line of the proposed New York Short Line cut-off.

CARLISLE.—A new bridge will be built by the Carlisle, Harrisburg & Chambersburg Turnpike Co. over Letart Spring, at Middlesex.

CATAWISSA.—Plans have been made to extend the bridge over the River from this place to the corner of Second and Main streets, at an additional cost of about $43,000.

CHAMBERSBURG.—The Grand Jury has approved the recommendation for a bridge over Conococheague Creek in Hamilton township.

——The viewers recommended the building of a new bridge over Antietam Creek near Hoover's Mill.

CHESTER.—The plans for the bridge to be built over Darby Creek, which is the dividing line between Delaware and Philadelphia counties, provide for a structure with a roadway of 36 ft. and 8-ft. sidewalks, to cost about $25,000.

CLEARWATER.—The Grand Jury has recommended the building of a new bridge over the west branch of the Susquehanna River in Bell township; also the building of a new bridge over Wilson Run in Newburg.

COLUMBIA.—Petition has been made by residents to the Pennsylvania Railroad to build subways at Locust and Walnut streets.

CONNELLSVILLE.—The report of the viewers in the matter of a bridge over Little Sandy Creek was confirmed by the court, and the bridge ordered to be built at the expense of the county, as recommended by the Grand Jury.

DANVILLE.—The proposed highway bridge over the Susquehanna River between Danville and South Danville is to consist of seven pin-constructed steel truss spans, each 186 ft. 9 in. long and 40 ft. wide.

DONORA.—Washington County Grand Jury has approved the finding of the Joint Board of Supervisors of Washington and Westmoreland counties recommending that a free bridge be built over the Monongahela River between this place and Webster.

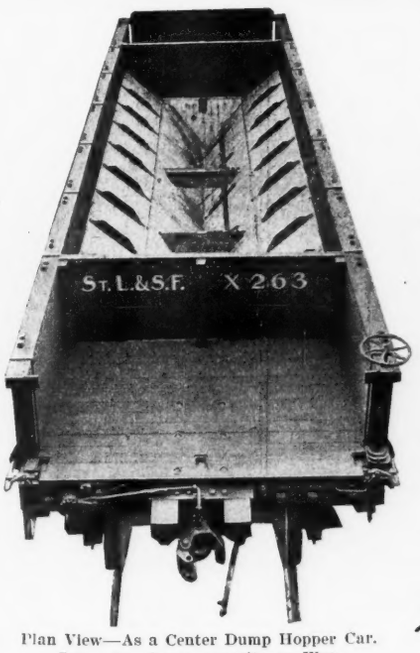
DOYLESTOWN.—The bridges carried away by water in the lower end of Bucks County near Bridgetown, Gerhart, Hatboro and in Cheltenham township, may be replaced with new structures.

DUNMORE.—The Lackawanna & Wyoming Valley Electric Railway Co. may build a bridge over Roaring Brook.

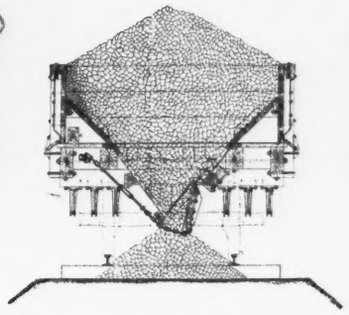
ERIE.—The Grand Jury has been petitioned by residents of Greene and Harbor Creek townships to build an iron bridge 350 ft. long over Four-Mile Creek at Kane.

FAYETTEVILLE.—The Chambersburg & Gettysburg Electric Railway is planning to build a bridge over the Cumberland Valley tracks at West Fayetteville, to cost $10,000.

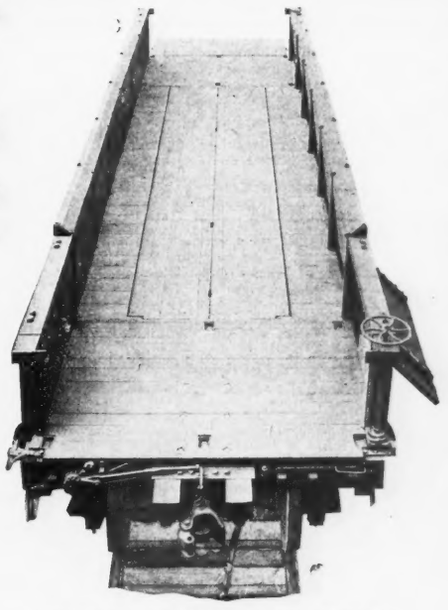
HART
Convertible Cars
EARN DIVIDENDS ALL THE YEAR AROUND.



Plan View—As a Center Dump Hopper Car.
Same car shown opposite as Flat-Bottom Side Dump.



Cross Section.
As Center Dump Hopper Car.



Plan View—As a Side-Dump Level Floor Car.
Same car shown opposite as Center Dump.

Showing Ballast distributed by HART CONVERTIBLE CARS

Absolutely dispensing with shoveling and placing ballast just **where** wanted and just the **amount** desired for any given condition.

Rodger Ballast Car Co.

RAILWAY EXCHANGE - - - - - CHICAGO, ILL.

FRANKLIN.—The Lake Shore & Michigan Southern may build a new bridge at the mouth of the French River to replace the present structure.

——Viewers appointed to select a site for bridges recommended a county bridge over Silver Creek; also one over Mill Creek.

GLENDON.—An iron bridge may be built over the canal at this place.

GLENOLDEN.—The City Council has passed an ordinance for the new Philadelphia, Baltimore & Washington bridge.

GREENSBURG.—The Jeannette, West Newton & Monongahela Street Railway Co., it is reported, will put up a steel bridge 600 ft. long over Big Sewickley Creek.

——The Pittsburg, McKeesport & Greensburg Street Railway Co., it is said, will build bridges along the extension of its road from Irwin to Trafford City, to include a 450-ft. trestle at Irwin, a 267-ft. trestle over the Westmoreland Coal Company's property, a 551-ft. bridge at Ardara, and four bridges of 70, 145, 112 and 95 ft., respectively, over Bush Creek.

HARRISBURG.—A vote will be taken next fall on the question of rebuilding the Mulberry street iron viaduct, at a cost of about $200,000. M. B. Cowden is City Engineer.

——The Pennsylvania proposes to build a bridge 800 ft. long and 45 ft. wide over the tracks at Greenwalls crossing, to cost about $50,000.

——The Steelton & New Cumberland Bridge Co. has been incorporated, with a capital of $300,000, to build a steel bridge 4,500 ft. long over the Susquehanna River at Steelton.

——The Philadelphia & Reading will build overhead bridges at Hemlock and Cameron streets.

——The Pennsylvania, local reports state, has completed plans for building an additional bridge over its tracks.

——The State Board of Public Grounds and Buildings will build a steel bridge over Penn's Creek one mile north of Selinsgrove.

——The court has approved the report of viewers recommending the building of bridges by the State over the Catawissa in Columbia County at the following places: Breisch's, $13,500; Catawissa, $20,000; Shermantown, $20,000, and Packer Mill, $25,000.

——Separate bids are wanter March 25, by J. M. Shumaker, Superintendent of Public Grounds and Buildings, for the substructure and superstructure of the bridge over the North branch of the Susquehanna River at Catawissa, Columbia County; for one over the Catawissa Creek on Mill street, Columbia County, and also one over the same creek in Beaver township.

HATBORO.—The County Commissioners have decided to build a three-arch stone bridge over a branch of the Pennypack Creek, on Moreland avenue.

HUNTINGDON.—Blair and Huntingdon counties will jointly build a bridge over the Juniata River in Tyrone township.

JOHNSTOWN.—The Mayor has signed the ordinance providing for a loan of $30,000 to build the steel approaches, about 400 ft. long, for the overhead bridge, to be built by the Pennsylvania Railroad at Prospect.

——The building of an overhead bridge in the 12th Ward is projected. Lee Masterton is City Engineer.

LANCASTER.—The Pennsylvania, it is reported, has accepted the ordinance providing for a subway at Walnut street, on which work will soon be commenced.

LANSFORD.—The Tamaqua & Lansford Street Ry. Co. may build an overhead bridge on its Middleport extension west of Buckville Grove. W. D. Zehner is Superintendent and Engineer.

LEBANON.—The Lebanon County Commissioners are planning to replace the wooden bridge in East Hanover township over the Swatara Creek with a structure to cost about $20,000.

LEHIGHTON.—A bridge is proposed to be built over the Lehigh River and the railroad tracks to connect Lehighton with Franklin township, to cost about $75,000.

LEWISTOWN.—The Lewistown & Reedsville Electric Railway Co. will build the steel superstructure of the Juniata River bridge at this place.

——The Pennsylvania, it is reported, will build two bridges between Granville and Mayesbridge on its Middle Division.

MILLHALL.—Viewers recommend the building of an iron bridge 120 ft. long, with 18-ft. roadway, over Fishing Creek.

MORAVIA.—A new bridge is to be built by the State at this place, to cost about $25,000.

MOUNT AIRY.—A bridge is proposed beteen this place and Roxborough over the Wissahickon at Allen's lane, to replace a former structure.

NESCOPECK.—Viewers recommend the building by the State of a two span steel bridge 200 ft. long to carry double track, at a cost of about $15,000.

NEWCASTLE.—A bridge is proposed over the Neshannock Creek to connect Cunningham and Water streets.

NEWPORT.—The Pennsylvania, reports say, has agreed to contribute $22,000 toward the cost of building an iron bridge over the Juniata River to replace the old wooden structure.

NORRISTOWN.—The Board of City Surveys has approved the ordinance for building two bridges, one over the Reading Railway at Gravers lane, Chestnut Hill, and the other at Erie avenue.

PHILADELPHIA.—Plans are being made and an ordinance has been introduced to appropriate $60,000 to open Twenty-fifth street from Diamond street northward: the work includes the building of a railroad bridge, to cost, together with the land damages, about $100,000.

——Residents of the northwestern section of the city have petitioned the Council to pass an ordinance for the opening of Twenty-ninth street between Glenwood and Sedgely avenues, which includes the building of a bridge, to cost about $125,000, over the tracks of the Pennsylvania at that point.

——Plans have been completed by the Bureau of Surveys for a new bridge on the line of Allegheny avenue to carry eight tracks of the New York branch of the Pennsylvania over the main thoroughfare. An appropriation of $80,000 is available out of the $16,000,000 loaned for this work; but the cost of the work will exceed the appropriation. Peter E. Costello is Director of Public Works.

——The Board of Surveyors is considering the question of building bridges over the Chestnut Hill branch of the Reading Railway; also over the Reading's Port-Richmond branch.

——The Philadelphia, Baltimore & Washington will build a new bridge in the vicinity of Paschalville, near Woodland avenue, to replace the present structure.

——The Mayor has vetoed the ordinance appropriating $500,000 for building a bridge over the Schuylkill River at Passyunk avenue, and recommends that bridges be built:

——At Allen's lane, over the Wissahickon Creek.

——Wyoming avenue, to the Spring Garden street bridge.

——Front street, over the connecting railroad.

——Large street, under the Frankford branch of the Philadelphia & Reading.

——Montgomery avenue, near the connecting railroad.

——Cresson street, over Midvale avenue.

——Willow Grove avenue, over Germantown avenue.

——Bellefield avenue, under the Tabor branch of the Philadelphia & Reading.

PITTSBURG.—The Select Council, at a recent meeting, it is reported, has reached an agreement with the Pennsylvania for this company to build a stone arch bridge over the Beechwood boulevard at Lincoln avenue, at a cost of about $149,000.

——Director of Public Works Bigelow, it is reported, will ask the City Council for an appropriation of $60,000 for the new bridge on Ellsworth avenue over the Pennsylvania tracks to replace the present structure. A steel structure 180 ft. long and about 40 ft. wide is to be built, to consist of two roadways for street cars and a footway on each side.

——The work for which bids will be asked during the present year, with appropriations available, is as follows:

——Foot bridge at Melancthon street, crossing the Baltimore & Ohio tracks and yards, $5,000.

——Smithfield Street Bridge.—Repainting, $6,000.

——Forward Avenue Bridge.—New plank floor, $2,000.

——33d Street Bridge.—New plank floor, $3,500.

——Wilmot Street Bridge.—Repainting, $1,200.

——Spencer Avenue Bridge.—Repairs (heavy timber work with concrete piers), $3,500.

——South 22d Street Bridge.—Repairs to masonry with some steel work, $8,000. A. W. Burk, Superintendent

PITTSTON.—The Delaware & Hudson, it is reported, will build a bridge 861 ft. long over Plymouth River.

POTTSVILLE.—A county bridge is to be built in Washington township.

READING.—The County Commissioners have decided to build a steel bridge over the Tulpehocken at Kalbach's mill; also to rebuild the Gorrell bridge over Moriattin Creek in Amity and to rebuild the Stoudt Ferry bridge.

——The Philadelphia & Reading bridge near Port Clinton, it is reported, will be replaced by a steel structure, for which plans are being made.

ST. CLAIR.—The Schuylkill Electric Railroad Co. will build an overhead bridge 100 ft. long and 25 ft. wide over the Philadelphia & Reading tracks.

SCRANTON.—The Grand Jury is considering a petition for the building of bridges over Aylesworth Creek and over Rushbrook, in Mayfield borough; also over the Lehigh River in Clinton township.

——This city and the Scranton Railway Co. may jointly build a bridge over the railroad tracks and the Lackawanna River at the foot of Mulberry street.

——The Delaware, Lackawanna & Western is reported having plans made for building a large concrete arch with a number of smaller arches over the Lackawanna River near Bridge street to replace the present structure.

——Four important bridges have been pronounced unsafe by an expert appointed to examine them. They are situated at Green Ridge, Elm, Lackawanna and Scranton streets. It is recommended that new bridges be built at Scranton and Elm streets.

——Plans are being made for building a viaduct from Providence road to Mifflin avenue and Mulberry street, to be 865 ft. long and 54 ft. wide, to cost about $120,000.

——The Delaware, Lackawanna & Western will put up a number of bridges between this place and Elmira, including one to cost $150,000 over the Chemung River east of Elmira, one west of Waverly, one east of Waverly over the Susquehanna, and a number of smaller structures at different points along the line.

SHAMOKIN.—Petition has been made to the County Commissioners to build a bridge over Shamokin Creek at Arch street. A bridge may also be built at Mulberry street.

——The County Commissioners, at a recent meeting, decided to replace the bridge between Packers Island and Northumberland with an iron structure.

——The Board of County Commissioners may build a new bridge at Market street.

SHARPSBURG.—The Baltimore & Ohio, it is reported, has decided to rebuild four bridges of the Pittsburg & Western over Pine Creek between this place and Bakerstown, at a cost of about $84,000.

SOUTH BETHLEHEM.—A county bridge 48 ft. long and 50 ft. wide may be built over Northampton Creek.

STEELTON.—A plan, it is reported, is under way to build a steel bridge over the Susquehanna River between this place and New Cumberland.

SUNBURY.—The Sunbury Bridge Co., which has been chartered to build a bridge over the Susquehanna River from a point near this place to Shamokin Dam, in Snyder County, at a cost of $175,000, will jointly build a bridge to carry electric cars with the Sunbury & Selinsgrove Electric Railway Co. George W. Drury, York, Pa., is interested.

——Soundings are being made in the river to locate the site for a combined highway and street railroad bridge here.

TOWANDA.—The court has consented to the building of a bridge over the Susquehanna River at Stores Ferry.

ULSTER.—The State will rebuild, at a cost of about $140,000, the bridge which was destroyed by high water. The new bridge is to be 2,000 ft. long, with four river spans and 19 shore spans.

——The State will rebuild the bridge in Bradford County which was destroyed by recent floods.

UNIONTOWN.—The Grand Jury, according to local reports, has approved the finding of the viewers recommending the building of a bridge in Stewart township; also a bridge over Mill Run in Washington township.

WAYNESBORO.—Petition has been made to the court for a bridge to be built over Antietam Creek.

WESTCHESTER.—The County Commissioners will build a new bridge over the Brandywine at Lenape.

WILKESBARRE.—It has been conditionally decided to build two bridges, one of which is to be a highway bridge between the tracks at North Wilkesbarre and the east end, at a cost of about $80,000; the other is to be a foot bridge over the tracks of the Lehigh Valley and Central Railroad tracks on East Market street.

——Work may soon be commenced on the new Berwick-Nescopeck bridge connecting the counties of Columbia and Luzerne.

——The Grand Jury has favorably reported on the question of building 39 small bridges, costing from $100 to $2,000 each, and aggregating about $20,000.

——The Lackawanna & Wyoming Valley will build a bridge over the Susquehanna River between West Pittston and Duryea; also between Plymouth and Nanticoke on the new extension of its road.

——The Common Council has passed a $400,000 municipal loan ordinance, which provides for an item of $25,000 for building a bridge over the railroad tracks at Butler street.

WILLIAMSPORT.—A bridge is proposed to be built over the Susquehanna River between this place and Jersey Shore.

——The viewers report in favor of a plate girder bridge 42 ft. wide over Hagerman's Run at East Central avenue.

——Viewers recommend the building of a new State bridge over Lycoming Creek at West Third street, the proposed structure to be of steel, 220 ft. long and 26 ft. wide, of one span, to cost about $40,000.

WOODBURY.—Viewers have been appointed to locate the site for a county bridge over Meadow Brook.

YORK.—York and Lancaster capitalists, it is reported, will build a bridge over the Susquehanna River at this place.

——The Northern Central is planning to build a steel bridge over Codorus Creek.

YORK FURNACE.—The York Furnace Bridge Co. is planning to build and operate a toll bridge over the Susquehanna River near this place.

——The Standard Oil Co., it is reported, will spend about $100,000 in building the proposed bridge over the Susquehanna River at this place, on condition that it is permitted to run a pipe line over the structure.

RHODE ISLAND.

NEWPORT.—The Government will spend $40,000 in deepening and widening the channel, and the State will spend an additional $100,000 in building a new lift drawbridge, with a span of about 100 ft., at Howland's Ferry. William H. Lawton is **City Engineer.**

PROVIDENCE.—Reports state that plans are being made for building a new bridge over Providence River at Point street to replace the present structure, which is 25 ft. wide, consisting of two shore spans of 140 ft. each and a draw 250 ft.

——Bids are wanted March 30 by the Board of Commissioners for building the approaches of the Rhode Island stone bridge, to consist of masonry walls and arches, with roadbed, with a total length of 1,625 ft., including a draw, for which bids are asked separately on the same date. Charles Alexander is a Commissioner.

——A resolution has been introduced in the City Council authorizing the building of an additional bridge over the Woonasquatucket River at Harrison avenue.

——The city and the New York, New Haven & Hartford, it is reported, have reached an agreement to eliminate grade crossings at Acorn, Grove and Dyke streets. The plans made by the City Engineer call for the building by the railroad of a steel bridge over the tracks from a point near the junction of Arthur avenue and Dean street to Harris avenue, at a cost of about $150,000, and approaches with retaining walls of about 1,000 ft. to be built by the city.

TIVERTON.—The General Assembly has passed an act appropriating $170,000 for the bridge at Tiverton to replace the present stone bridge.

SOUTH CAROLINA.

CHARLESTON.—On February 24, the Lower House of Congress passed a bill authorizing the building of a bridge over Ashley River, in Charleston County.

GREENVILLE.—The Southern, according to local reports, will put up new steel bridges over Georges Creek, a branch of the Saluda River, Connoross Creek, Seneca River and Suwanee River, to replace the present structures.

Davidson Water Softener

500,000 Gallons Daily Capacity

It is the Only System that has stood the test of severe Winter weather

27 Plants in operation from 1 to 3 years

BUILT BY THE OTTO GAS ENGINE WORKS FOR THE LAKE SHORE & MICHIGAN SOUTHERN RY. AT FREMONT, OHIO

No other company contracts for complete installation of Water Station and Softener.

Write for Catalogue

Otto Gas Engine Works

T. W. SNOW, Manager

360 Dearborn Street, CHICAGO

ST. GEORGE.—On February 24, the Lower House of Congress passed a bill authorizing a bridge over Ashley River, in Dorchester County.

SOUTH DAKOTA.

OACOMA.—On January 24, the Lower House of Congress passed a bill extending the time for commencing the construction of the bridge over the Missouri River by the Federal R. R. Co. to January 8, 1906, and for the completion of the bridge to January 8, 1908.

YANKTON.—A bill has been introduced in the United States Senate extending the time for the completion of the bridge of the Winnipeg, Yankton & Gulf over the Missouri River at this place.

TENNESSEE.

——The Lower House of Congress, on January 9, passed a bill reviving and declaring in force a bill to authorize a bridge over the Tennessee River, in Marion County, Tenn., the bridge to be commenced within one year and completed in three years from January 1, 1905.

CARTHAGE.—Residents are agitating the question of building a bridge at this place over the Cumberland River, to cost about $50,000.

CHATTANOOGA.—The Chattanooga Electric Railway Co. has acted upon the proposed plan of building a steel viaduct over the Cincinnati Southern tracks at Oak street, and will jointly build with the county and two steam roads a viaduct on McCallie avenue.

——The Cincinnati Southern, according to reports, will rebuild the bridge over the Tennessee River near Kingspoint.

——Plans have been completed for building a bridge across the railroad tracks at Eleventh street. The bridge will be a pin-connected steel truss 176 ft. long and 18 ft. above the tracks.

CLEVELAND.—The County Court has appropriated $700,000 to build a steel bridge over Candy's Creek at Williams Ford.

JEFFERSON.—An iron or steel bridge will be put up by Jefferson County over Massey Creek. J. T. Holt, Clerk, Dandridge, Tenn.

KNOXVILLE.—An agreement is reported having been reached by the railroads interested and the city authorities for building the viaduct on Clinch avenue, on which work is to be commenced next month. It is to be a concrete structure reinforced with steel, 700 ft. long, with a roadway of 30 ft. and two 6-ft. sidewalks, to cost about $90,000. J. T. Moreland is City Engineer.

——The Atlanta, Knoxville & Northern will build a bridge over Little River on its proposed line between this place and Wetmore.

MARION.—A bill has been offered in the Lower House of Congress to amend the act for the construction of a bridge over the Tennessee River at this place. The amendment provides that the act shall be void unless work is commenced by January 1, 1906, and completed within three years.

MEMPHIS.—City Engineer Omberg has announced that the city will replace the wooden bridge at the north entrance to Elmwood Cemetery with a $12,000 structure.

NASHVILLE.—An act was introduced in the State Legislature in January authorizing this city to issue bonds for building a bridge, with one center pier and one opening 200 ft. wide, with a roadway wide enough to carry double tracks, two driveways and 9-ft. sidewalks, over the Cumberland River, to cost about $500,000. Captain A. J. Harris is Chairman of the Committee.

——Application will be made to the Legislature for permission to issue $500,000 of bonds to buy land for the approaches of the new Cumberland River bridge.

——The Tennessee Central and the city are considering plans for a joint bridge over the Cumberland River.

TAZEWELL.—A steel bridge, consisting of three spans, will be built over the Powell River by Claiborne County Commissioners, for which bids will soon be asked.

TEXAS.

BEAUMONT.—The Texas & New Orleans and the city will jointly build a steel bridge over the railroad tracks, probably at Archer street, to cost about $30,000.

BROWNSVILLE.—The St. Louis, Brownsville & Mexico is planning to build a steel bridge over the Rio Grande River, at a cost of about $125,000.

DALLAS.—The long bridge leading to Oak Cliff will be repaired, at a cost of $10,000.

——According to reports, the Missouri, Kansas & Texas is planning to put in about 10 new steel bridges on its Dallas Division.

DENISON.—Plans are being made for building bridges on Burnett, Crockett, Houston and Lamar avenues; also at Nelson street.

——According to local reports, the Missouri, Kansas & Texas will, during the coming summer, put up iron bridges on the Dallas Division, at a cost of about $200,000.

EL PASO.—The El Paso & Southwestern has decided to put up a new steel bridge over the San Pedro River.

FORDS BLUFF.—The Gulf, Colorado & Santa Fe is planning to build a steel bridge over the Neches River, to cost $25,000, on its Gulf, Beaumont & Kansas City branch.

FORT WORTH.—Press reports state that the bridge of the Fort Worth & Denver City over the Canadian River at Tascosa, the bridge of the Rock Island on the line of its road between Logan and Tucumcari, and the Pecos Valley bridge have been carried away by high water.

GALVESTON.—The engineering department of the Santa Fe is asking bids on the masonry piers for the new steel bridge to be built over the Sabine River on the Jasper & Eastern Railroad. The steel work will consist of two 215-ft. truss spans and one 100-ft. girder. The cost of the bridge will be about $100,000.

HOUSTON.—Bonds for $40,000 may be issued for improving the Bayou bridges.

——The city may rebuild the bridge at Caroline and Lamar streets.

——A bridge is projected to connect Young and Laura streets, joining the fourth and sixth wards.

MARLIN.—The Commissioners' Court is locating the site for a new bridge over the Brazos River between the Falls and the Milan County line.

PRESIDIO.—The Kansas City, Mexico & Orient is planning to build a steel bridge over the Rio Grande River.

SMITH FERRY.—The Commissioners' Court, at a recent meeting, authorized the building of a bridge, to cost between $20,000 and $25,000, over the Brazos River.

TEMPLE.—The City Council is considering the question of issuing $8,000 in viaduct bonds for a viaduct to be built over the Santa Fe tracks on South First street. The entire cost of the work will be about $24,000.

VERMONT.

CHELSEA.—A steel and concrete bridge will be built at this place. F. C. Waldo is Selectman.

VIRGINIA.

ALEXANDRIA.—The Board of Supervisors of Alexandria County has been petitioned to negotiate with the Washington Southern for building a viaduct 30 ft. wide and 640 ft. long over about 56 tracks.

APPOMATTOX.—A bridge is proposed over the Appomattox River here, on which work will soon be begun.

BRISTOL.—The Norfolk & Western may build bridges over its yard at Mary and Edmund streets.

CLARKSVILLE.—Three spans and piers of the new toll bridge at this place now under construction were carried away January 7 by high water; loss, about $10,000.

CULPEPER.—A steel bridge 224 ft. long over the Rapidan River between Culpeper and Spottsylvania counties is to be built.

DANVILLE.—Residents have petitioned for a bridge over the Dan River, to cost about $30,000.

GILMERTON.—The Norfolk & Western may widen its bridge over the south branch of the Elizabeth River, and put in a new steel draw, at a cost of about $90,000.

McKENNEY.—Bids are wanted by George R. Stone, at Ordsburg, for building an iron bridge 140 ft. long over the Nottoway River for the joint account of Brunswick and Dinwiddie counties.

MICHAUX.—Bids will soon be asked for building a steel bridge about 300 ft. long over the James River, in Powhattan County, Goochland. Address William W. Michaux.

NORFOLK.—The steel bridge over Mahone's Canal, which is a combined highway and street car bridge, may have to be replaced by a new structure.

——The Norfolk & Western, it is reported, is planning to put up a bridge in South Norfolk to carry three or four tracks.

RICHMOND.—Plans for the proposed concrete bridge to be built on the site of the present Mayo bridge over the James River call for a structure 32 ft. wide, with 26-ft. roadway and a 6-ft. sidewalk. The whole structure is to be of concrete paved with granite blocks. The Richmond end consists of seven spans 550.47 ft. long; the Manchester end, of 11 spans 847.25 ft. long, making the total length of the bridge 1,397.72 ft. The distance across the island is about 350 ft.; this is to be paved in the same manner as the bridge. Richmond and Manchester will jointly pay for the work, which is to cost about $250,000, and an issue of 50-year bridge bonds to that amount has been authorized by the City Council of Manchester.

——A bridge is proposed over the James River near the present Mayo toll bridge, to have a 40-ft. roadway and 10-ft. sidewalks, to cost about $200,000.

SUTTON.—Buckingham and Nelson counties will jointly build a bridge over the James River, to cost about $9,000.

WARM SPRINGS.—Several new bridges will be put up by Bath County. F. L. LaRue is County Clerk.

WASHINGTON.

BELLINGHAM.—Plans have been completed for building a drawbridge over Nooksack River. They will have to be approved by the Secretary of War. R. L. Kline is County Clerk.

GOLDENDALE.—Bids, it is reported, will be asked by A. M. MacLeod, County Auditor, April 4, for building a 120-ft. bridge and a 180-ft. trestle and approach over the Klickitat River, in Klickitat County.

KELSO.—A project is under foot to build a bridge 900 ft. long, with an 80-ft. draw, over Cowlitz River.

PASCO.—The Northern Pacific will put up a new steel bridge over the Columbia River at this place, to cost about $300,000.

SEATTLE.—Plans have been completed for building two steel bridges on rock foundations over Third and Fourth avenues, on Main and Jackson streets, to cost $55,000. The Main street bridge will be 66 ft. wide and 125 ft. long, and the one on Jackson street, 85 ft. wide and 115 ft. long.

SPOKANE.—A viaduct may be built over the tracks of the Oregon Railroad & Navigation Co. at Washington street.

——The Northern Pacific has under consideration the question of replacing a long wooden trestle with a steel structure.

——Plans are being made and bids will soon be asked by the city officials for two plate girder steel bridges over the Spokane River, to be 110 ft. long, with 51-ft. roadway and 12-ft. sidewalks. L. B. Handley is Superintendent of Streets.

——Bids are wanted April 4, by the Board of County Commissioners, for building a steel bridge on the Marsh road over Latah Creek. Z. Stewart is Clerk.

TACOMA.—The County Commissioners are considering a plan to replace the present bridge over Touchet River with a 200-ft. bridge; also to build a bridge 500 ft. long over Walla Walla River.

WALLA WALLA.—Plans are ready for building the proposed bridge over Dry Creek. L. W. Loehr is County Surveyor.

WEST VIRGINIA.

BENWOOD.—The City Railway Co. of Wheeling is planning to build a bridge across the Ohio River.

CHARLESTON.—An 800-ft. span of the suspension bridge over Elk River connecting East and West Charleston, which collapsed December 15, may soon be rebuilt.

CLARKSBURG.—The County Commissioners are considering the question of building a steel bridge over West Fork River, to cost about $11,000.

GRAFTON.—Petitions have been made for two bridges over the Valley River, but no action will be taken until April. L. Kitzmiller is Clerk.

HUNTINGTON.—The Chesapeake & Ohio, according to local reports, is planning to build a bridge over the Ohio River.

NOLAN.—The Lower House of Congress has passed a bill authorizing the Borderland Coal Co. to build a bridge over Tug Fork of Big Sandy River, about two miles east of this place, at the boundary line between West Virginia and Kentucky.

PARKERSTOWN.—A bridge is proposed to be built over the Kanawha River at George street, for which $100,000 of bonds may soon be issued.

WISCONSIN.

ANSON.—A steel bridge, it is reported, will be built by this town over the Chippewa River, to cost about $10,000.

CALEDONIA.—The Caledonia Bridge Commissioners may build an iron bridge 140 ft. long over the Root River.

CLEVELAND.—A bridge is proposed between this place and Arthur over the Chippewa River, to cost about $10,000.

CUSHING.—A bridge is to be built over the Trade River in Polk County. James Peterson, Cushing., Wis., can give information.

EAGLE POINT.—The town has voted to bond itself for its share of the cost of a new bridge to be built jointly with the town of Anson, at a cost of about $7,500.

EAU CLAIRE.—The City Council will build a steel plate girder bridge at North Barstow street, to cost about $25,000, or a steel concrete arch bridge, to cost about $30,000.

FOND DU LAC.—The Town Board will probably build a steel bridge over Fond du Lac River to replace the present wooden structure near Mihill's Corners.

GREEN BAY.—The city will probably build a bridge over the East River, to cost about $10,000.

HARTFORD.—Two stone bridges are proposed over the river at Rural street.

JANESVILLE.—Plans are being prepared for a bridge over Rock River, to cost about $20,000. C. B. Kerch is City Engineer.

——A resolution has been passed by the City Council to vote on the question of building a new bridge at Racine street, to cost about $25,000.

KIMBERLY.—A bridge is proposed over the Fox River, to be built by the Kimberly & Clark Co.

LA CROSSE.—The question of requiring the Chicago, Milwaukee & St. Paul to build a new viaduct over its tracks at Rose street is still pending in the City Council. Nothing probably will be done this year.

——The City Council, it is reported, will build a bridge over Black River.

MILWAUKEE.—The Chicago, Milwaukee & St. Paul, according to reports, will pay $125,000 toward the cost of a new viaduct at Sixth street and First avenue. The company will also be required to elevate its tracks on the south side.

——The Finance Committee has under consideration a resolution to build a bridge over the Kinnickinnic at an avenue of the same name, to cost about $125,000.

——Plans are being made by Charles J. Poetsch, City Engineer, for building a viaduct at Sixth street, to cost about $530,000.

——Plans for the proposed viaduct on Grand avenue call for a structure 1,360 ft. long, 60 ft. wide, with an approach on the east side of 410 ft., to be of stone or steel construction; the cost varying from $200,000 to $500,000.

——Plans are being made for the double-deck bridge at Washington street, to have a 40-ft. roadway with 16-ft. sidewalks, to cost about $430,000. Charles J. Poetsch is City Engineer.

——This city, it is reported, has decided that the Chicago & North Western must elevate its tracks on the Madison Division entering the city. The cost of the work will be about $800,000.

——A new bridge is proposed over the Milwaukee River at Clarke or Wright street; probable cost, $125,000.

——Residents are agitating the question of building the viaduct at Twenty-seventh street, toward the building of which the Council will appropriate $75,000.

——The Tenth street bridge in South Milwaukee may be strengthened to carry street cars.

MONTELLO.—A bridge is proposed over the Fox River about eight miles from this place.

PRAIRIE DU CHIEN.—According to reports, the Chicago, Milwaukee & St. Paul will build a railroad bridge this spring.

RACINE.—Plans are being made for building a bascule bridge at Main street, to cost about $80,000, for which $65,000 has been appropriated.

SUPERIOR.—The City Council has been petitioned to build a bridge over the Nemadji River at Grand avenue.

TWO RIVERS.—The Chicago & North Western will build a railroad bridge over the Neshoto River at Adams street.

Canada.

ALBERTA.

EDMONTON.—Application has been made to the Legislature by the Calgary & Edmonton for permission to issue $1,000,000 of bonds for building a high-level bridge over the Saskatchewan River between this place and Strathcona.

BRITISH COLUMBIA.

CALABOGIE.—A new steel bridge will be built over the Madawaska River.

GRAND FORKS.—The Minneapolis, St. Paul & Sault Ste. Marie, it is reported, will build a large bridge over the Red River about 20 miles north of this place.

SAVE MONEY

You can save your Company

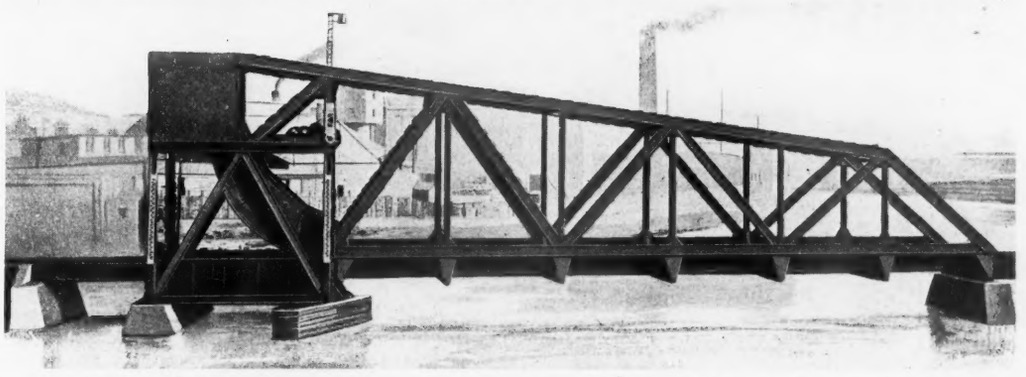
$25,000.00 TO $100,000.00

or more in

ONE MINUTE

of your time when **deciding** upon the type of bridge your company will build if you **decide** for the **MODERN, scientific, safe, simple** and **economical**

SCHERZER ROLLING LIFT BRIDGE



Scherzer Rolling Lift Bridge over Cuyahoga River, Cleveland, Ohio, for N. & S. S. Railway
160-foot Span, Double Track

Longest Simple Truss Span Bascule Bridge in the World.

This Bridge is Being Duplicated for the Baltimore & Ohio Railroad at Cleveland.

More than **60** center-pier

swing bridges have already been **superseded, discarded, scrapped,** and **replaced** by **modern SCHERZER ROLLING LIFT BRIDGES** for **Railroads, Electric Railways** and **Highways.**

HIGHEST AWARD

WORLD'S FAIR, ST. LOUIS, 1904.

Write us for Information, Photographs, Sketches and Estimates

The Scherzer Rolling Lift Bridge Co.

MAIN OFFICES: MONADNOCK BLOCK, CHICAGO, U S. A.

VANCOUVER.—The Northern Pacific and the Portland Railway Co. are considering the question of jointly building a double-deck bridge over the Columbia River, to cost about $3,000,000. The upper deck will be used for electric cars and the lower one for the steam road.

——A. R. Newell, Manager of the White Pass & Yukon Railway, states that it is the intention of the company to replace all wooden bridges with steel structures as soon as possible.

MANITOBA.

GLADSTONE.—The Municipal Councils of Westbourne and Lansdowne will build a Warren truss bridge on concrete abutments over the White Mud River.

MORRIS.—At a public meeting just held, it was decided to ask the Dominion and Provincial Government to pay a part of the cost of building a steel highway bridge over the Red River at that point.

SHELLMOUTH.—The Canadian Pacific, it is reported, will build a bridge over the Assiniboine River at this place.

——Shell River Council will probably build a new steel bridge at this place.

——Three new bridges will be built over the Assiniboine River.

WINNIPEG.—Petition will be made to the Government to pay a share of the cost of building a large steel bridge over the Red River from North Winnipeg to Kildonan, to cost about $75,000.

——The City Councils of Winnipeg and St. Boniface will jointly build a steel bridge over the Assiniboine River.

——Engineers are locating the new Canadian Northern Railroad bridge east of Main street. It is to be a steel structure with concrete abutments

NEW BRUNSWICK.

FREDERICTON.—Surveys are being made by the Provincial Public Works Department for a new steel bridge to be built over the St. John River at Pokiok.

ST. JOHN.—The Canadian Pacific has under consideration the question of building a two-span bridge over St. John Harbor.

NORTHWEST TERRITORY.

BATTLEFORD.—The Canadian Northern will build a bridge at this place. Superintendent Pace, of Edmonton, will have charge of the work.

——The Dominion Government is asking for bids for building the piers and abutments, also for the steel superstructure of a bridge to be built here.

EDMONTON.—The Calgary & Edmonton has applied to the Legislature for permission to issue $1,000,000 of bonds for building a high-level bridge over the Saskatchewan River, between Edmonton and Strathcona.

PRINCE ALBERT.—The Canadian Northern will build a bridge over the Saskatchewan River 15 miles southeast of this place.

SASKATOON.—The Qu'Appelle, Long Lake & Saskatchewan Railway is to replace the Saskatoon bridge with a steel structure, to cost $250,000.

——Extensive improvements are proposed on the Prince Albert branch of the Canadian Pacific.

——The Board of Trade has asked the Government for aid to build a combined railroad and traffic bridge here.

NOVA SCOTIA.

BRIDGEWATER.—The Halifax & Southwestern will build a bridge over the La Harve River. T. H. White is Chief Engineer.

GLACE BAY.—The Town Council will build a steel bridge over the railroad tracks on the line of the proposed new road to New Aberdeen.

——A steel bridge will be constructed over Caledonian Creek by the Town Council. Approximate cost, $20,000.

NEW GLASGOW.—The iron bridge over the East River near this place, a section of which gave way, carrying into the river below a train of the Intercolonial Railway, on November 7, will be replaced by a steel structure. W. B. McKenzie, Moncton, N. B., is Chief Engineer.

ONTARIO.

AMHERSTBURG.—The Canadian Southern Bridge Co. has petitioned Parliament for an extension of time for building a bridge or tunnel over or under the main channel of the Detroit River from this place toward Stony Island.

——The Town Council has decided to build three steel bridges over Belle River.

BADEN.—It is said that bids will soon be asked for building a new steel bridge at New Prusia, Ont., to cost about $5,000.

BARRIE.—A committee has been appointed to make plans and estimate the cost of a steel bridge to be built over the Nottawasaga River near Van Vlack.

——The County Council may build a new bridge over the Mud River at Glencairn.

BRADFORD.—It is the intention of the Dominion Government to build a steel bridge over the Holland River at this place.

BUXTON.—J. W. Shackleton, Civil Engineer, is preparing plans for a new steel bridge with concrete abutments over the Waddick drain.

CAIRO.—A new steel bridge on concrete and masonry abutments will be built at Mosside, Euphemia township. Address Angus Smith, C. E., Stratford, Ont.

CALABOGIE.—The County Councils of Bogot and Blythfield will erect a steel bridge at this place.

CARILLON.—The Dominion Government has been petitioned by the Central Counties Railway Co. for permission to build a bridge from Point Fortune, on the south side of the Ottawa River, to this place, in the County of Argenteuil.

FINCH.—A by-law to raise $20,000 to build two steel bridges was carried.

FORT FRANCIS.—A bridge is proposed over Rainy River between this place and Koochiching by a new road soon to be incorporated in Canada.

FORT WILLIAM.—The Board of Trade favors building a steel bridge over the Kaministiquia River, and petition has been made to the Government for an appropriation to begin the work.

——The City Council is having plans made for a steel bridge over the river.

GALT.—The ratepayers of North Dumfries have approved a by-law to raise $10,000 to build a steel bridge over the Grand River.

——The Canadian Pacific will probably widen the subway at Bond street.

GODERICH.—The County Council will build a steel bridge during the summer over the Bayfield River, known as Maccan's bridge.

——Bids will soon be asked for a bridge over the Sauble River between the townships of Bosanquet and Stephen.

——The Road and Bridge Committee of the County Council recommends that the following bridges be built in 1905, according to the engineer's report, and that bids be called for and contracts let: At Ashfield, south of Amberley, over Eighteen-Mile Creek, on the lake shore, to be 95 ft. long and 16 ft. wide; on the boundary between Ashfield and West Wawanosh over the Nine-Mile River, to be 60 ft. long and 16 ft. wide; over the Maitland River between Morris and Turnberry, 110 ft. long and 16 ft. wide; two bridges on the boundary between Tuckersmith and Hibbert, one over the Bayfield River, 60 ft. long and 16 ft. wide, and the other over Morrison's Creek between Huron and Perth.

GUELPH.—A bridge is proposed to be built on the boundary line between Wellington and Waterloo counties. James Beattie is County Clerk.

HAMILTON.—Bids will soon be asked by the Hamilton, Grimsby & Beamsville Railroad for building a bridge over its tracks.

INGERSOLL.—A new steel bridge will be built at Alma street.

LANARK.—A new steel bridge will be built over the Clyde River.

LONDON.—A new steel bridge will be built between Westminster and Yarmouth.

——The Southwestern Traction Co. will build five steel bridges on its electric line to St. Thomas and Port Stanley. The longest will be over the ravine to the south of St. Thomas, which, it is estimated, will cost $50,000.

——The County Council of Middlesex and the Commissioners from Lambton and Huron will soon ask bids for building a bridge over the Auxsauble River near McGillvary and for other bridges to be built during the summer.

MITCHELL.—Two steel bridges will be built in the township of Grey.

NORTH BAY.—The Temiskaming & Northern Ontario will build a bridge over the Montreal River.

OTTAWA.—The New York & Ottawa expects to replace many of the wooden bridges on the line of its road with iron structures.

——The Railway Committee of the House of Commons has granted an extension of seven years to complete the proposed bridge of the Canada Southern over the Detroit River and five years for the bridge to connect with Grand Island, below Niagara Falls. The time for the construction of the Canada & Michigan Bridge & Tunnel Company's bridge over the Detroit River was also extended for five years.

——Petition has been made to the Minister of Railways and Canals for a bridge to be built over the canal at Somerset street.

——The Government officials have under consideration the question of building a bridge over the Rideau at Somerset street.

——The Railway Committee of the House of Commons has adopted the bill authorizing the Calgary & Edmonton Railway to build a bridge over the North Saskatchewan River between Strathcona and Edmonton, to cost about $600,000.

——The city and county will remove the embankment at the eastern approach of the Canadian Pacific bridge over the Rideau River and build a steel bridge with a clear span of 150 ft. in its place.

OWEN SOUND.—A vote was taken January 2 to raise $30,000 for building a steel bridge.

PAISLEY.—Bids will soon be asked by Greenock Township Council for rebuilding Watson's bridge, to consist of a steel superstructure on concrete abutments.

——Bids may also be asked to rebuild the Riverside bridge and an additional bridge 300 ft. long on the Eighteenth concession.

PORT COLBORNE.—Plans are being made by the Grand Trunk for building a bridge over the Welland Canal at this place.

RAT PORTAGE.—A foot bridge will be built over the Canadian Pacific tracks at Julius Creek; also approaches to the steel bridge over the east branch of the Winnipeg River.

ST. CATHARINES.—The City Council is planning to replace the present Robbins bridge with a new structure.

——The new steel bridge to be built at Queenston street will cost in the neighborhood of $15,000.

SANDWICH.—The committee on roads and bridges of the County Council has recommended that a steel bridge be built over the Canard River at this place.

SARNIA.—This city and the township of Bosanquet will jointly build a bridge over the Klondike. J. D. Stewart is City Clerk.

SEAFORTH.—The Tuckersmith Township Council will put up a steel bridge to replace the Campbell bridge.

SOUTH AUGUSTA.—Bids will soon be asked by Edwardsburg and Augusta counties for building a steel bridge on the town line between the two counties.

STEWARTVILLE.—McNab Township Council will build a steel bridge over the Medawaska River, to cost about $18,000.

STRATHFORD.—The townships of Downie, Fullarton and Blanckard have petitioned the County Council to build a bridge over the Thames River on the town line at the junction of these townships. W. Davidson is County Clerk.

TARA.—Bids will soon be asked for building a steel bridge over the Sauble River in the township of Arran.

THOROLD.—A new steel bridge will be built over the Welland Canal at this place.

TORONTO.—Plans have been approved by the Railway Commission for building nine steel bridges on the line of the Toronto & James Bay Railway.

——Extensions to the Don River bridge at Queen street are proposed, at a cost of $200,000. C. H. Rust is City Engineer.

——The Board has been petitioned to authorize the building of a new bridge to Turner's Baths, to cost about $7,600 and $2,500 for the approaches.

——Plans for the Yonge street bridge are awaiting the Government's approval. They call for a bridge 940 ft. long and 60 ft. wide, with 38-ft. roadway supported on masonry abutments, 160 ft. south from Front street and 140 ft. north from Lake street. Between the abutments there will be eight steel supports.

TUCKERSMITH.—A 90-ft. steel bridge on concrete abutments will be built over the Bayfield River. A. G. Smillie will have charge of the work.

WEST FORT WILLIAM.—The Canadian Pacific, according to reports, will build a bridge over the river at this place.

WINCHESTER.—Dunn & Fullerton, engineers, are preparing plans for a steel bridge to be built over the Nation River.

WINDSOR.—The Grand Trunk may build a bridge over the St. Clair River between this place and Detroit.

——Sandwich County Council has authorized the raising of $30,000 for building several iron bridges over Belle River.

PRINCE EDWARD ISLAND.

CHARLOTTETOWN.—The combined railroad and highway bridge under construction over the Hillsborough River may be completed this year, and will be one of the largest bridges in Eastern Canada, being over a mile long, including the abutments and approaches, with piers placed 250 ft. apart, which have all been completed. The bridge is being put up by the Government, at a cost of about $1,500,000. M. J. Haney, of Toronto, is the contractor.

QUEBEC.

BEAUCE JUNCTION.—The Quebec Central may build new bridges at Sherbrooke and at St. Victor.

MONTREAL.—Application will be made next session for an act authorizing the Montreal Bridge Co. to buy the property, rights and franchises of the Montreal & Longueuil Bridge Co., or to amalgamate with said company, to authorize a change in the proposed site of the bridge to be built over the St. Lawrence River between this place and Longueuil, and to fix a date for its completion. Hon. U. H. Dandurand, Hon. R. Forget and James Cochrane are among the principal promoters.

——The Canadian Pacific is planning to put up, during the present year, a number of steel bridges and to replace many of its wooden bridges with steel structures on the Mountain Division of its road.

——The Canadian Pacific will build a large bridge over the French River on the line of its road between Romford and Byng Inlet.

——The International Railway Bridge Co., of New Brunswick, is seeking incorporation to build a combined highway and railroad bridge over the Restigouche River at Campbellton. Thomas Malcolm, a railroad contractor, of Campbellton; Thomas Cochran and J. W. Stevens, of Edmonton, and Charles Riordan, of St. Catharines, Ont., are interested in the company.

——Application has been made by the Westminster Bridge Co. to the Dominion Parliament for incorporation for the purpose of acquiring from the British Columbia Government the bridge now building over the Fraser River at New Westminster; also to build bridges. The application is made by John Hendry, President of the Vancouver, Westminster & Yukon and Western Railway, the road over which the Great Northern will have an entrance into Vancouver to connect with its ferry to Victoria, operated by the Victoria Terminal Railway & Ferry Company.

QUEBEC.—The Quebec Bridge & Railroad Co. will build a bridge over Chaudiere River.

SASKATCHEWAN.

BATTLEFORD.—Plans and specifications have been approved for the Canadian Northern Railway bridge over the North Saskatchewan River near this place, superstructure to consist of nine deck spans and two through spans. M. H. McLeod, Winnipeg, Man., is Chief Engineer.

PRINCE ALBERT.—Plans are being made for building a highway bridge over the Saskatchewan River.

MEXICO.

GUADALAJARA.—The local government is again considering the question of building an arch bridge over the San Juan River.

——A Bermijillo syndicate, composed of Mexico City capitalists, has obtained a franchise authorizing the building of an arch viaduct over the San Juan de Dios River, which is within the limit of the city.

MEXICO CITY.—It is reported that the War Department has approved the plans for the large iron bridge to be built over the Grand Canal to San Lazara and Vaquita Plains, on which work will soon be commenced.

MONTEREY.—One of the largest railroad bridges in Mexico is to be built over the Pesqueria River, near San Ysidro, on the Matamoras extension of the National of Mexico. The structure will be more than 1,500 ft. long, consisting of four spans of about 375 ft. each, and will have a height of about 250 ft.

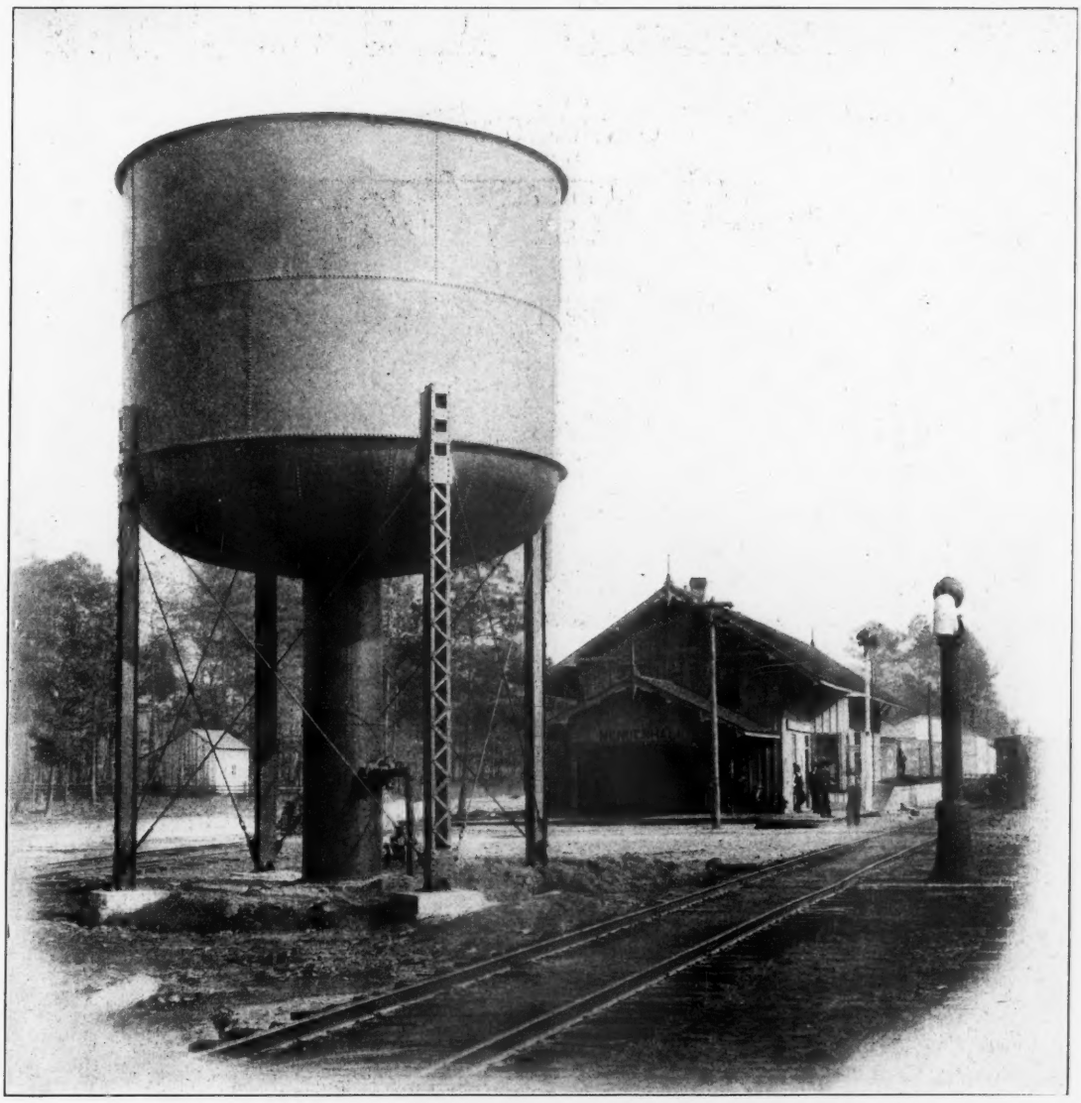
——According to local reports, the Mexican Central will replace many of its bridges along the line of its road between this place and Tampico with steel structures.

OCOTLAN.—The Mexican Central, it is said, will build an iron bridge at Ocotlan, State of Jalisco.

ORITZ.—The large iron bridge of the Mexican Central over the San Pedro River has been damaged to the extent of about $150,000. Three piers and one abutment are standing, which will be a saving of $60,000 in the cost of rebuilding.

SAN MIGUEL.—The St. Louis, Brownsville & Mexico and the National, it is reported, will jointly build a bridge over the Rio Grande.

They Do Not Leak



PATENT APPLIED FOR

STEEL RAILROAD TANKS

OUR LATEST DESIGN ILLUSTRATED ABOVE EMBODIES MANY NEW FEATURES. DETAILED INFORMATION UPON REQUEST.

Chicago Bridge & Iron Works

HORACE E. HORTON, Proprietor

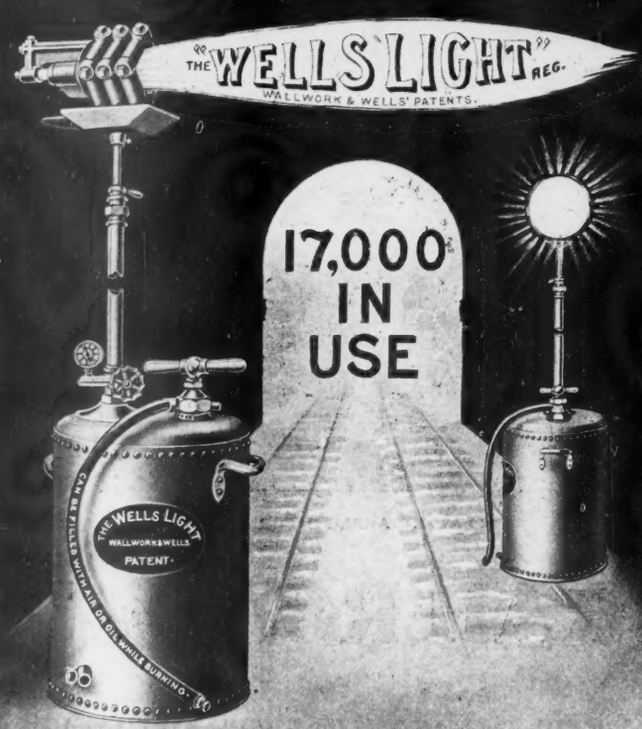
105th and Throop Streets CHICAGO

THE "WELLS LIGHT"

ALL CONTRACTORS AND RAILROADS USE IT

A PORTABLE LIGHT FROM KEROSENE OIL

FOR TUNNEL WORK
FOR WATERWORKS
FOR TIRE EXPANDING



17,000 17,000 17,000 17,000 17,000 17,000 17,000 17,000

800-2000 TO 4000 CANDLE-POWER
FROM KEROSENE OIL
CAN BE FILLED WITH AIR OR OIL WHILE BURNING

THE WELLS LIGHT MFG. CO.

44-46 WASHINGTON ST., NEW YORK
EDWARD ROBINSON - SOLE PROPRIETOR

GENERAL NEWS SECTION

NOTES.

The Lower House of the Legislature of Oklahoma Territory has passed a bill to punish discrimination by railroad companies.

The Pennsylvania Railroad in rebuilding one of its telegraph lines along the New York division has lately put up a 25-conductor cable between Newark and Jersey City, eight miles.

The new Governor of West Virginia, Mr. W. M. O. Dawson, in his inaugural address declared the most important legislative need of the state to be a law prohibiting unjust freight charges and creating a railroad commission.

The Legislature of Montana recently passed a bill establishing a state railroad commission, but it was vetoed by the Governor because it named the commissioners instead of leaving their appointment to the Executive.

The highest freight-movement record of the Pittsburg division of the Pennsylvania Railroad, made on Sunday, March 5, in the effort to clear the congested yards, was, for 24 hours, 71 freight and 18 passenger trains eastward and eight freight and 25 passenger trains westward.

Wholesale coal dealers in Providence, R. I., say that the movement of coal by water to Providence, New Bedford, Fall River, Stonington and Allyn's Point has greatly fallen off, and they claim that the coal which they formerly handled is now coming by rail all the way over the New York, Ontario & Western and the lines of the New Haven road which connect with the Ontario.

Chairman Elkins, of the Senate Committee on Interstate Commerce, has announced that the committee will begin hearings on railroad rate regulation on Monday, April 17. It is the intention of the committee to first take up the constitutional questions involving the right of Congress to delegate power to fix rates. It also is the intention of the committee to conduct the hearings with all possible expedition.

The legislature of the State of Washington has passed a law to create a railroad commission. The board is to consist of three men, to be appointed by the Governor, and each commissioner will be required to give a bond of $20,000 for the faithful performance of his duties. A section of the bill says that all railroad and express charges shall be just, fair, reasonable and sufficient. The commission will have power to correct rates complained of and the order "shall of its own force take effect" in 20 days, etc.

The Illinois State Railroad and Warehouse Commission has announced that it will reopen the inquiry into freight rates which was begun nearly three years ago and which has never been brought to a conclusion. Considerable testimony was taken in 1902 and arguments were made in January, 1903. Later, on the circulation of a rumor that the legislature might denounce the board for its inaction, it was given out that the commission would make radical reductions in rates, but this never came to anything. It is said that Decatur, Springfield and Bloomington are the only towns in which the complaint has now been revived.

At Topeka, Kan., last week in the hearing of a suit brought against the Atchison, Topeka & Santa Fe, the fact was brought out that all of the Kansas railroads in the Missouri freight bureau had changed their tariff sheets, about the time the Kansas oil field began to give promise of becoming important, so that petroleum would be accepted for transportation in tank cars only when destined to a "consignee who possessed storage facilities for the oil after it reached its destination." This shut out independent refiners unable to erect storage tanks in the towns to which they shipped oil. Complaint is made that the railroads will accept demurrage on any other class of freight than oil. The independent refiner desires to ship his oil to a small town in his own tank car, and unload and sell from his wagons until the car is empty.

When the New York State Legislature is in session any troubles which may arise to becloud the happiness of the people of New York City are promptly dissipated by "legislation while you wait"—or at least the public-spirited legislators put forth their best efforts to this end. On March 9 Senator Grady introduced a bill which would provide a beautifully simple and direct method of preventing the New York City railroads from ever again achieving such an easy victory over striking employees as the city witnessed last week. The bill provides that no person shall act as conductor or motorman without a license, and the Bureau of Licenses must not grant an application if it appears that the employment of the applicant would imperil public safety. The proposed law would apply only to "cities containing two or more counties." This sophistical phrase, used to generalize the Act so as to evade the real or supposed constitutional prohibition of special legislation, means New York.

Mr. Wroth, Secretary of the Baltimore Chamber of Commerce, declares that the agreement which is said to have been reached by the railroads in regard to export grain from west of the Missouri river "puts the Atlantic seaboard out of business" in this line. The agreement, to go into effect April 1, is said to provide for the following rates, in cents per 100 lbs.:

	To Gulf ports.	To Baltimore.
From Omaha	18	22½
From Kansas City....	17	22½

These, said Mr. Wroth, have been the actual rates paid on a good deal of the corn that has been moved this season, and the Baltimore dealers have found themselves unable to compete with those who have their grain sent by the Gulf of Mexico. The report of exports of corn from New Orleans and Galveston (for February 6,381,346 bushels, as compared with 4,550,000 bushels from New York, Philadelphia and Baltimore) does not truly show the advantage which has been gained by the gulf ports, as there were 1,322,000 bushels of corn at New Orleans which had been loaded on the vessels but not cleared. The Baltimore merchants are now unable even to fill the room offered by the regular line steamers, much less to load entire cargoes.

Royal Welcome for Congress Guests.

According to Chicago press despatches each of the railroads entering the city has subscribed a thousand dollars towards a fund to entertain and welcome the delegates to the International Railway Congress when they visit Chicago on their tour of inspection after the gathering at Washington. President S. M. Felton, of the Chicago & Alton, is Chairman of the Executive Committee in charge of the arrangements. The program arranged includes inspection of the tunnel of the Illinois Tunnel & Telephone Company, a trip to the Pullman shops, to the stock yards, the harvester works, railroad stations, parks, churches, banks and public buildings; also an inspection of the track elevation of the suburban lines, of the electric lines which parallel steam roads, and of the drainage canal. The entertainment of the delegates is to be closed with a banquet. As the programme thus far announced does not sound like a very expensive one to carry out, and as a fund in excess of $25,000 has already been raised, the banquet ought to be a good one.

Contracts Awarded for the Barge Canal.

The superintendent of Public Works, Albany, N. Y., announces that the following contracts for the barge canal work have been let:

Contract No. 2, Erie canal, Section 1, for the excavation and protection of the sides of the canal from the Mohawk river to a point about one-fourth of a mile west of the head of Lock No. 3 and the construction of locks numbers 2 and 3, with the approaches and appertaining parts, to the Ferguson Contracting Co., New York, for $852,330.

Contract No. 3, Champlain canal, lake line, for the excavation of the canal and the protection of its banks from a point below Fort Miller to a point above the guard gate at Crooker's Reef and the change in location of the old Champlain canal, and all other incidental work, to Sundstrom & Stratton, New York, for $670,497.

Contract No. 5, Erie canal, Section 7, for the construction of the canal and its appurtenances from a point near Mosquito Point bridge over Seneca river to station 5,373, east of the village of Savannah, length 5.66 miles, to Lindon W. Bates, New York, for $381,987.50.

This leaves but one contract undisposed of—namely, contract No. 6, located just west of Rochester, on which bids were received last December.

Proceedings of the International Engineering Congress.

The American Society of Civil Engineers, under whose auspices the International Engineering Congress was held at the World's Fair, St. Louis, last September, has issued a circular relative to the publication of the Proceedings of the Congress. The publications of the Congress will consist of six volumes, of a total of more than 3,000 pages with 600 illustrations. There are 97 papers, which were prepared by special invitation, and the resulting discussions on the 37 subjects selected for presentation. The subjects discussed were: Harbors, Natural Waterways, Artificial Waterways, Traffic on Improved Waterways, Dredges, Wharves and Piers, Purification of Water for Domestic Use, Sewage Disposal, Disposal of Municipal Refuse, Railroad Terminals, Underground Railways, Live Loads for Railroad Bridges, Ventilation of Tunnels, Manufacture of Steel, Manufacture of Cement, Concrete and Concrete Steel, Tests of Materials of Construction, Purification of Water for the Production of Steam, Turbines and Water Wheels, Locomotives and other Rolling Stock, Passenger Elevators, Pumping Machinery, Steam Turbines, The Substitution of Electricity for Steam as a Motive Power, Electrical Power-Generating Stations and Transmission, Ordnance, Fortifications, Naval Architecture,

Marine Engineering, Light-Houses and other Aids to Navigation, Dry Docks, Irrigation, Highway Construction, Deep Foundations, Mining Engineering, Engineering Education and Surveying.

These volumes, while issued for convenience as parts of Vol. LIV. of the *Transactions* of the society, form a separate publication, and, owing to the great expense, which the American society has had to bear alone, it will not be possible to distribute them free of charge to any person or institution not now enrolled as a member of the congress. The price to those who are not members has been fixed at $5 per volume (in paper covers), subject to a discount of 25 per cent., which would make the cost of the set $22.50. Two of the volumes are now in press, and the others will follow very soon.

New N. Y. C. Grain Elevator at Weehawken.

Mr. W. B. Pollock, Manager of the Marine Department of the New York Central, exhibited to a party of guests on March 13 the company's new two-million bushel grain elevator at Weehawken. This elevator will not be put into commission until the grain movement assumes greater volume. It cost approximately $1,250,000 and is built entirely of steel and cement and brick. It brings up the total capacity of the New York Central elevators at New York harbor to 4,750,000 bushels. The new elevator is 200 ft. high, 100 ft. long and 300 ft. deep; contains 59 bins 15 ft. square x 30 ft. deep; and it has, including half bins and split bins, a total of 268 storage bins.

Manufacturing and Business.

The Locomotive Appliance Company has moved its headquarters from St. Louis to Chicago. The offices are in Suite 400, Old Colony Building.

The Wheeling & Lake Erie R. R. Co. has ordered from Allis-Chalmers Company's Electrical Department, the Bullock Electric Mfg. Co., of Cincinnati, equipment for its new machine and car repair shops at Canton, Ohio, consisting of two engine-type, 250-volt generators, one of 150 k.w. and the other 75 k.w., and 16 motors with capacities aggregating 300 h.p.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies see advertising page 24.)

New England Railroad Club.

At the meeting of this club on Feb. 14, the paper of the evening was on railroad signaling by J. M. Fitzgerald, Signal Engineer of the Boston & Albany. The paper was of an elementary nature.

Western Railway Club.

At the March meeting of the club, to be held Tuesday evening, the 21st inst., at 7:30 o'clock in the Stratford Hotel, Chicago, papers will be presented on "Tank Locomotives" by E. E. R. Tratman, and on "Maintaining Railroad Repair Shop Machinery," by M. K. Barnum. The latter paper was to have been presented at the January meeting but was postponed for lack of time.

PERSONAL.

—Mr. George B. Harris, a Director of the Canadian Pacific, died recently at the age of 67.

—Mr. William Woodford King, General Superintendent of the Norfolk & Southern, died at the home of his brother in Norfolk, Va., on March 8, at the age of 51. He was born in Geneva, N. Y., and was educated at Exeter Academy and Dartmouth College. Mr. King began his railroad service on the Manhattan Railway in New York City, but had been on the Norfolk & Southern for 20 years or more.

—Mr. D. H. Conklin, who died at his home in Decatur, Ill., March 10, at the age of 74, was a telegraph operator on the Erie Railroad at Piermont, N. Y., in 1851. He learned to telegraph under Ezra Cornell and in the year named went to the Erie where, under Superintendent Minot, he took part in the pioneer railroad telegraph work for which that company is famous. He was for some years train despatcher. In 1870 he went to Illinois and served on the Illinois Central for many years. In 1894 he was Mayor of Decatur.

—The accompanying portrait is that of Mr. David H. Moffat, President of the Denver, Northwestern & Pacific, an article regarding which is printed elsewhere in this issue. Mr. Moffat is one of the pioneers of Colorado and his name has for years been closely identified with the development, growth and prosperity of that state. He was born in Washingtonville, N. Y., in 1837, and, at the age of 15, became a messenger in the New York Exchange Bank. The following year he became a clerk and later cashier of a bank in Des Moines, Iowa. He was subsequently in the same business in Omaha, and in 1860 started a bank in Denver. In

1866 he was made Cashier, and soon after President, of the First National Bank of Denver, which position he still retains. He was the promoter and President (1884-91) of the Denver & Rio Grande and subsequently built, largely with his own funds, the Florence & Cripple Creek Railroad, connecting the famous Cripple Creek mining region with the Denver & Rio Grande. The enterprise in which he is now engaged—the construction of what is popularly known as the Moffat road—will develop the unlimited mineral wealth and other resources of northwestern Colorado and northeastern Utah.

—Mr. George G. Cochran, Assistant to the President of the Erie Railroad, died in New York City on Monday, March 13, following an operation for appendicitis. Mr. Cochran was born in Sandusky, Ohio, in 1842, and began his railroad career as a clerk in the freight office of the Cincinnati, Dayton & Eastern. In 1874 he was made General Freight Agent of the Atlantic & Great Western (Erie); in 1893 Traffic Manager of the New York, Lake Erie & Western, and the Chicago & Erie, and in 1895, when the Erie was reorganized, he was made its Fourth Vice-President. In 1900, he was made Traffic Manager in charge of the freight traffic on the lines west of Salamanca, and for the last three years he had held the position he occupied at the time of his death.

—Mr. H. M. Cryder, recently appointed Principal Assistant Engineer of the Wabash at St. Louis, was born at Chillicothe, Ohio. He received his technical training at the Ohio State University, leaving in his junior year to go to the Baltimore & Ohio. In 1901

Mr. Cryder resigned and took a position in the engineering department of the Wheeling & Lake Erie at Cleveland. In 1902 he was Chief Draftsman, and had charge of the building of new docks, coaling machine and yard at Huron, Ohio. Later he was made Assistant Engineer in charge of the Cleveland office, and then Chief Draftsman of the Wabash. In 1903 he was made Assistant Engineer, and had charge of the plans and construction of the World's Fair Terminal Station and tracks, and other new terminal facilities of the Wabash in St. Louis.

—Mr. Robert H. Rogers, recently appointed Master Mechanic of the Plymouth Division of the New York, New Haven & Hartford at South Boston, Mass., began his railroad service on the Baltimore & Ohio. After serving his apprenticeship at the Riverside shops he was, in 1895, made general piece-work inspector, and continued in that position until piece-work was abolished. He then became roundhouse foreman at Pittsburg. In 1897 he resigned and went to Silao, Mex., where for a time he held a similar position on the Mexican Central, later being transferred to Mexico City as erecting shop foreman. In 1901 he returned

to the Baltimore & Ohio as inspector of new locomotives at builders' shops. Two years later he was promoted to be Assistant Master Mechanic at the Mount Clair shops in Baltimore, and then to General Foreman at Cumberland. About a year ago he again

resigned and went to the Southern Railway, where he was roundhouse foreman at Knoxvill, Tenn., until the first of February.

—Mr. Richard Somers Hayes, for a number of years President of the St. Paul & Duluth, died recently in New York city at the age of 59. Mr. Hayes was a native of Philadelphia and was widely known among railroad men. He began his railroad service as Assistant Engineer on the Erie. From that company he went to the Texas & New Orleans as Chief Engineer and General Manager. In 1873 he was appointed Chief Engineer of the International & Great Northern, and in the spring of the year following was made Vice-President and General Manager. He later went to the Missouri Pacific as First Vice-President. For about five years from 1883 he was First Vice-President of the Wabash, St. Louis & Pacific, and in 1888 was chosen to be President of the St. Paul & Duluth. At the time of his death Mr. Hayes was one of the Directors of the Atchison, Topeka & Santa Fe.

—On March 1 the authority of Mr. W. F. Jones, Auditor of the Denver, Northwestern & Pacific, was extended over the traffic department, with the title of General Traffic Manager and Auditor. Mr. Jones was born in St. Louis in 1868. At the age of 15 he entered the service of the Empire Fast

Freight Line as a clerk. In 1872 he went to the St. Louis, Iron Mountain & Southern. Five years later he became chief accountant of the Cairo Short Line. In 1895 he went to Colorado, where he was Auditor and Secretary of the Florence & Cripple Creek. In 1901 he resigned to become Secretary and Auditor of the Lacomb Electric Company of Denver, and Auditor of the Denver & Northwestern. The next year he was appointed Secretary and Auditor of the Colorado-Utah Construction Company and Auditor of the Denver, Northwestern & Pacific, to which the title of General Traffic Manager is now added.

—Captain Robert B. Pegram, for several years Assistant General Manager of the Southern Railway, is dead, at the age of 57. Mr. Pegram was born in Norfolk, Va., and had been in railroad service since 1867. From 1873 to 1875 he was Assistant Engineer and Purchasing Agent of the Mobile & Ohio, and from the latter year until 1901 held at different times various positions on the Mobile & Montgomery, the Memphis & Charleston, the International & Great Northern, and the Southern; and up to a short time ago, when ill health compelled him to resign, he was President and General Manager of the Vera Cruz & Pacific.

—Mr. L. C. Fritch, Assistant to the General Manager of the Illinois Central, is about 37 years old, and began his railroad service in the engineering department of the Ohio & Mississippi in 1884. In 1892 he was appointed Engineer of Maintenance of Way. In 1893, when the O. & M. was absorbed by the Baltimore & Ohio Southwestern, Mr. Fritch became Division Engineer, and in 1899 he was appointed Superintendent of the Mississippi Division. In 1904 he went to the Illinois Central, where he was engaged in special work for the Assistant General Manager, and on the first of this month assumed the title of Assistant to the General Manager. Mr. Fritch has been Secretary of the American Railway Engineering and Maintenance of Way Association since its organization, and is a member of the American Society of Civil Engineers.

ELECTIONS AND APPOINTMENTS.

Alabama State Railroad Commission.—B. B. Comer has been elected President, succeeding John V. Smith.

Atlantic & Birmingham.—G. C. Smith has been appointed Superintendent, with headquarters at Brunswick, Ga.

Chicago Great Western.—C. L. Nichols has been appointed Superintendent of the Southwest Division, with headquarters at Des Moines, Iowa, succeeding C. P. Stembel, transferred.

G. Reith has been appointed Superintendent of Terminals at Oelwein.

Cleveland, Cincinnati, Chicago & St. Louis.—See Peoria & Eastern.

El Oro Mining & Railway Co.—F. A. Lattig, hitherto Superintendent of Terminals on the National of Mexico, has been appointed Superintendent of the E. O. M. & R. C.

Ft. Worth & Rio Grande.—W. A. Tuley, General Passenger Agent, has resigned from the F. W. & R. G., and the St. Louis, San Francisco & Texas, effective April 1.

Illinois Central.—L. C. Fritch has been appointed Assistant to the General Manager of this company and the Yazoo & Mississippi Valley. His office will be at Chicago.

Long Island.—Samuel Rea, Fourth Vice-President of the Pennsylvania, has, owing to the serious illness of Mr. Potter, been elected President pro tempore of the L. I.

Missouri, Kansas & Texas.—F. W. Bailey has been appointed Superintendent of Bridges and Buildings of the M., K. & T., and the Missouri, Kansas & Texas Ry. of Texas, succeeding the late A. B. Manning. Mr. Bailey's headquarters will be at Denison, Texas.

Missouri, Oklahoma & Gulf.—George F. Morse, Chief Engineer, has resigned.

Missouri Pacific.—George W. Smith has been appointed Superintendent of Machinery, in charge of Motive Power, Car Equipment and Shops, succeeding J. W. Luttrell, Superintendent Locomotive and Car Department, resigned. This latter position has been abolished. Mr. Smith's headquarters will be at St. Louis.

B. H. Mann is Signal Engineer of the M. P. and its leased and controlled lines, with office at St. Louis. The signal department is now separate from the telegraph department.

O. L. Garrison has been elected a Director, succeeding C. G. Warner, resigned. A. G. Cochrane succeeds Mr. Warner as a Director on the St. Louis, Iron Mountain & Southern.

New York, New Haven & Hartford.—J. S. Elkton has been elected a Director, succeeding William D. Bishop, resigned.

Peoria & Eastern.—The authority of the following officers of the Cleveland, Cincinnati, Chicago & St. Louis has been extended over the P. & E.: C. E. Schaff, General Manager; J. Q. Van Winkle, General Superintendent; H. F. Houghton, Assistant General Superintendent; William Garstang, Superintendent of Motive Power, and G. W. Kittredge, Chief Engineer.

Pere Marquette.—Eugene Zimmerman, President of the Cincinnati, Hamilton & Dayton, has been elected Chairman of the Board of the P. M.

Pullman Company.—Dr. T. R. Crowder has been appointed Superintendent of Sanitation, with office at Chicago.

St. Louis & San Francisco.—The office of Third Vice-President A. S. Dodge has been removed from St. Louis to Chicago.

St. Louis, Iron Mountain & Southern.—See Missouri Pacific.

St. Louis, San Francisco & Texas.—See Ft. Forth & Rio Grande.

San Pedro, Los Angeles & Salt Lake.—W. H. Bancroft, Vice-President and General Manager of the Oregon Short Line, has been appointed First Vice-President of the S. P., L. A. & S. L., succeeding R. C. Kerens.

Seaboard Air Line.—A. J. Poole, Master Mechanic at Savannah, has been appointed Master Mechanic at Atlanta.

Southern.—S. D. Cushing, Electrical Engineer, has resigned to become Assistant to the President of J. B. Semple & Company, of Pittsburg, Pa.

Toledo, St. Louis & Western.—G. H. Ross, hitherto General Traffic Manager, has been appointed Second Vice-President.

West Jersey & Seashore.—Robert W. Downing has been elected a Director, succeeding E. C. Stokes, resigned.

Yazoo & Mississippi Valley.—See Illinois Central.

LOCOMOTIVE BUILDING.

The Elgin, Joliet & Eastern has ordered 10 locomotives from the American Locomotive Co.

The Illinois Northern has ordered two switching locomotives from the American Locomotive Co.

The Southern Indiana has ordered 50 locomotives from the Rogers Works of the American Locomotive Co.

The Buffalo, Rochester & Pittsburg has ordered two Atlantic type (4-4-2) passenger locomotives from the Baldwin Works.

The Lake Shore & Michigan Southern is reported to have ordered five locomotives from the Brooks Works of the American Locomotive Co.

The Canadian Pacific, it is reported, will build 10 simple 10-wheel (4-6-0) locomotives at its Angus shops, similar to the 40 locomotives, specifications for which were given in our issue of February 3.

The Oregon State Portage Railway has ordered one mogul (2-6-0) locomotive from the Davenport Locomotive Works for April delivery. This locomotive is to weigh 66,000 lbs., with 55,000 lbs. on drivers. The special equipment will include: Westinghouse air-brakes, Monitor injectors, Nathan lubricators, United States metallic piston and valve rod packings, Buck headlights and cast-steel frames.

The Pennsylvania is building at its Juniata shops 28 class E 2 and class E 3 Atlantic-type (4-4-2) passenger locomotives, 25 class D 16 B eight-wheel (4-4-0) passenger locomotives, and 46 class B 6 (0-6-0) switching locomotives. The latter are to be equipped with fire hose equipment which can be connected with the locomotive tank and used in case of fire. This is to be kept, when not in use, in a drum on the left side of the cab.

The Chicago, Lake Shore & Eastern, as reported in our issue of March 3, has ordered six simple consolidation (2-8-0) locomotives from the American Locomotive Co. for September delivery. These locomotives are to weigh 188,000 lbs., with 169,000 lbs. on driv-

ers; cylinders, 22 in. x 28 in.; diameter of drivers, 57 in.; straight boiler, with a working steam pressure of 200 lbs.; 372 National iron tubes 2 in. in diameter and 3 ft. 6 in. long; firebox, 96 in. x 72 in.; tank capacity, 7,000 gallons, and coal capacity, 13 tons. The special equipment will include: Westinghouse air-brakes, Magnesia boiler lagging, Simplex brake-beams, Major couplers, Star headlights, Ohio and Simplex injectors, Monarch journal bearings, Coale safety valves, Leach sanding devices, Nathan sight-feed lubricators, Simplex springs, Crosby steam gages, Midvale driving-wheel tires and steel wheel centers.

The Grand Central Station & Harlem Line (N. Y. C. & H. R.), as reported in our issue of March 3, has ordered five six-wheel switching (0-6-0) locomotives from the Schenectady Works of the American Locomotive Co. for April delivery. These locomotives are to weigh 151,000 lbs. on drivers; cylinders, 21 in. x 28 in.; diameter of drivers, 57 in.; straight boiler, with a working steam pressure of 180 lbs.; total heating surface, 2,679.39 sq. ft.; 306 iron tubes, 2 in. in diameter and 16 ft. long; firebox, 72⅛ in. x 65¼ in.; grate area, 32.7 sq. ft.; tank capacity, 4,500 gallons, and coal capacity, 7½ tons. The special equipment will include: Westinghouse-American combined air-brakes, Carnegie steel axles, Sansom bell ringer, Sal Mountain asbestos boiler lagging, National-Hollow brake-beams, Lappin brake-shoes, Gould couplers, Rochester headlights, Nathan and Monitor injectors, Magnus journal bearings, Consolidated muffled safety valves, Leach sanding devices, Nathan triple sight-feed lubricators, Railway Steel-Spring Co.'s springs, Utica steam gages, Midvale steel driving-wheel tires, Paige tender-wheel tires, main wheel centers cast-steel, others chilled cast-iron; Taylor iron staybolts, piston type valves, Fox brasses and steel tender trucks.

The Lehigh Valley has ordered 20 locomotives, 10 from the American Locomotive Co. and 10 from the Baldwin Works. Three of these are to be six-wheel switching (0-6-0) locomotives, to weigh about 118,000 lbs. on drivers; cylinders, 20 in. x 24 in.; diameter of drivers, 50 in.; straight radial stayed boiler, with a working steam pressure of 170 lbs.; total heating surface, 1,470 sq. ft.; 236 charcoal iron tubes, 2 in. in diameter and 11 ft. long; firebox, 96 in. x 66 in.; grate area, 44 sq. ft.; tank capacity, 6,000 gallons, and coal capacity, eight tons. Four of the locomotives will be eight-wheel switchers, to weigh about 172,000 lbs. on drivers; cylinders, 21 in. x 28 in.; diameter of drivers, 55½ in.; straight radial boiler, with a working steam pressure of 200 lbs.; total heating surface, 2,248 sq. ft.; 274 charcoal iron tubes, 2 in. in diameter and 14 ft. 6½ in. long; firebox, 114½ in. x 96 in.; grate area, 73.6 sq. ft.; tank capacity, 6,000 gallons, and coal capacity, eight tons. Ten of the locomotives will be 10-wheel (4-6-0) fast freight locomotives, to weigh 199,330 lbs., with 155,230 lbs. on drivers; cylinders, 21 in. x 28 in.; diameter of drivers, 68½ in.; straight radial stayed boiler, with a working steam pressure of 200 lbs.; total heating surface, 3,269 sq. ft.; 378 charcoal iron tubes, 2 in. in diameter and 15 ft. 8 in. long; firebox, 120⅛ in. x 102 in.; grate area, 85 sq. ft.; tank capacity, 7,500 gallons, and coal capacity, 12 tons. The special equipment for all will include: Westinghouse air-brakes, Snow bell ringers, Keasby & Mattison Magnesia boiler lagging, Diamond special brake-beams, Tower all-steel couplers, Glazier Twentieth Century headlights, Hancock (type E) injectors, Magnus metal journal bearings, United States metallic piston and valve rod packing, Consolidated safety valves, Leach sanding devices, Detroit (No. 21) sight-feed lubricators, Ludlum springs, Ashcroft steam gages, Latrobe driving wheel, and tender wheel tires for the switching locomotives, and driving wheel, truck wheel and tender wheel tires for the 10-wheel locomotives; cast-steel driving wheel centers, and Paige tender wheel centers for the switching locomotives, and Paige truck wheel and tender wheel centers for the 10-wheel locomotives.

CAR BUILDING.

The Astoria Electric Co. has ordered some open cars from the St. Louis Car Co.

The American Car & Foundry Company reports miscellaneous orders for six cars.

The Canadian Pacific, it is reported, will build 40 baggage cars at its Farnham shops.

The Maine Central is reported to have ordered 300 freight cars from the Laconia Car Co.

The North Alabama Traction Co. has ordered some open cars from the St. Louis Car Co.

The East St. Louis & Suburban has ordered 200 gondolas from the American Car & Foundry Co.

The Erie is reported to have ordered 1,500 additional steel underframe box cars of 80,000 lbs. capacity.

The Lake Shore & Michigan Southern is reported to have ordered 250 freight cars from Haskell & Barker.

The Indianapolis Abattoir Company has ordered 75 refrigerator cars from the American Car & Foundry Co.

The Big Bend Coal Mining Company, of Philadelphia, Pa., has ordered 100 cars from the Pressed Steel Car Co.

The Seaboard Air Line is reported to have ordered 250 freight cars from the Huntington Works of the American Car & Foundry Co.

The Detroit & Toledo Shore Line, as reported in our issue of March 3, has ordered 100 gondolas from the Madison Works of the American Car & Foundry Co.

The Lake Shore & Michigan Southern has ordered 1,500 steel twin hopper gondola cars of 100,000 lbs. capacity from the Pressed Steel Car Co., to be duplicates of the cars now under construction for this road by the Pressed Steel Car Co.

The Boston & Maine is reported to be building 100 box cars of 60,000 lbs. capacity, to be 36 ft. long inside measurement, and of American Railway Association standard, at its Concord shops. Further specifications were published in our issue of March 3.

The Mobile, Jackson & Kansas City, as reported in our issue of March 3, has ordered 500 box cars of 60,000 lbs. capacity from the American Car & Foundry Co. These cars are to be 36 ft. 7⅝ in. long, 9 ft. 1⅝ in. wide and 7 ft. 5 in. high, with wooden frames and underframes. They will have Westinghouse air-brakes.

The Woodward Iron Company's Railroad has ordered 20 steel hopper bottom ore cars of 100,000 lbs. capacity from the Pressed Steel Car. Co. and 20 coal cars of 60,000 lbs. capacity from the Georgia Car Co. The company is also building 50 coke crate cars of 40,000 lbs. capacity at its own shops. The ore cars are to weigh 32,300 lbs., and measure 23 ft. long, 9 ft. 6 in. wide, and 9 ft. 6 in. high. The special equipment includes Westinghouse air-brakes and Climax couplers.

The Minneapolis, St. Paul & Sault Ste. Marie has ordered 10 refrigerator cars of 60,000 lbs. capacity from the American Car & Foundry Co. These cars will weigh 36,000 lbs., and measure 36 ft. 10 in. long, 9 ft. 2½ in. wide and 7 ft. 10 in. high from sill to plate. The special equipment includes: Common Sense bolsters, Simplex brake-beams, Westinghouse air-brakes, National-Fulton brasses, Washburn couplers, Miner draft rigging and McCord journal boxes and lids.

The Lehigh Valley has ordered six wide vestibule passenger cars, each to have 77 seats. These cars are to weigh about 112,000 lbs., and measure 70 ft. long over end sills, 9 ft. 8 in. over side sills and 14 ft. 5¼ in. over all. The special equipment will include: Lehigh Valley specification steel axles, American body double cast-steel bolsters, Diamond special brake-beams, Christie brake-shoes, Westinghouse high-speed air-brakes, Magnus metal brasses, Gould straight-shank couplers, National curtain fixtures, rose pattern, green silk faced Pantasote curtain material, Gould friction draft gear and buffers, Symington inside pattern dust guards, Symington journal boxes and lids, Pintsch gas, Gould steel platforms, Ludium springs, Lehigh Valley standard six-wheel trucks with journals 5 in. x 9 in., Pullman wide vestibules and Paige steel-tired wheels.

The Atchison, Topeka & Santa Fe, as reported in our issue of Feb. 10, has ordered 20 70-ft. coaches and five 70-ft. chair cars from the Pullman Co.; 1,500 box cars of 70,000 lbs. capacity, as reported in our issue of March 10, from the Standard Steel Car Co.; 1,000 box cars of 70,000 lbs. capacity, 350 40-ft. Rodger ballast cars of 100,000 lbs. capacity, as reported in our issue of March 10, and 38 60-ft. steel underframe postal cars from the American Car & Foundry Co. All box cars will be 36 ft. long, 8 ft. 6 in. wide and 8 ft. high. The special equipment for all will include: Kewanee brake-beams for ballast cars and National-Hollow brake-beams for postal cars; Westinghouse air-brakes, Hewitt brasses, Janney couplers for box and ballast cars, Forsyth curtain fixtures for coaches and chair cars, Miner draft rigging, Fromveller heating system and Symington journal boxes for coaches, chair and postal cars.

The Delaware, Lackawanna & Western has ordered eight broad vestibule coaches, seven suburban coaches and two combination passenger and baggage cars from Barney & Smith, instead of 19 passenger cars, as reported in our issue of March 3; and eight suburban coaches from the American Car & Foundry Co., instead of 10 coaches, as reported in our issue of March 3. All cars are for May and June delivery. The vestibule coaches and combination cars will be 60 ft. long, over end sills; the suburban coaches will be 57 ft. long, over end sills; all cars will be 9 ft. 8 in. wide, over side sills, and 6 ft. 9½ in. high, from top of sill to bottom of plate. The special equipment for all will include: Westinghouse brake-beams and air-brakes, Long Streeter steel back brake-shoes, Magnus metal brasses, Gould couplers, Forsyth curtain fixtures, Pantasote curtain material, O. M. Edwards' trap door fastenings for vestibule coaches and combination cars, Miner tandem draft rigging, Pullman journal boxes, Commercial acetylene gas light, Standard Steel platforms, Barney & Smith seats, Pittsburg Spring & Steel Co.'s springs, Pullman vestibules for vestibule coaches and combination cars, and Boies wheels with Midvale tires.

The Brooklyn Rapid Transit, as reported in our issue of March 3, has ordered 100 cars for elevated service; 50 from the Cincinnati Car Co., 25 from the Jewett Car Co., and 25 from the Laconia Car Co. The company has also ordered 200 semi-convertible cars for its surface lines: 175 from the J. G. Brill Co. and 25 from the Jewett Car Co. The 100 elevated cars, which are to have a capacity of 62 persons, will weigh 65,000 lbs., and measure 48 ft. long, 8 ft. 9 in. wide and 13 ft. 2 in. high from rail, with wood and metal frames and underframes. The special equipment will include: Cambria Steel Co.'s hammered steel axles, bolsters made by car builders, Peckham Manufacturing Co.'s brake-beams, American Brake-Shoe & Foundry Co.'s "U "brake-shoes, New York air-brakes, Peckham Manufacturing Co.'s brasses, Van Dorn couplers, Curtain Supply Co.'s Brooklyn Heights Railroad standard curtain fixtures, Pantasote curtain material, J. L. Howard's Brooklyn Heights Railroad standard door fastenings, wooden doors, Van Dorn draft rigging, Economy Lubricator Co.'s dust guards, Electric Consolidated heating system, Peckham Manufacturing Co.'s journal boxes, C. A. Willey Company's paint, Brooklyn Heights Railroad standard platforms and canvas roofs, Heywood rattan seats, Peckham Manufacturing Co.'s springs and trucks, and Taylor Wheel Co.'s fused wheels.